Australia A $4.75 New Zealand NZ $ 6.50
Singapore S $9.45 Hong Kong H $23.50
Malaysia M $9.45 Sweden 30:-SEK

$2.95 USA

68' MICRO JOURNAL

OS-9 Atari Amiga Mac S-50

6800 6809 68008 68000 68010 68020 68030

The Magazine for Motorola CPU Devices *For Over a Decade!*

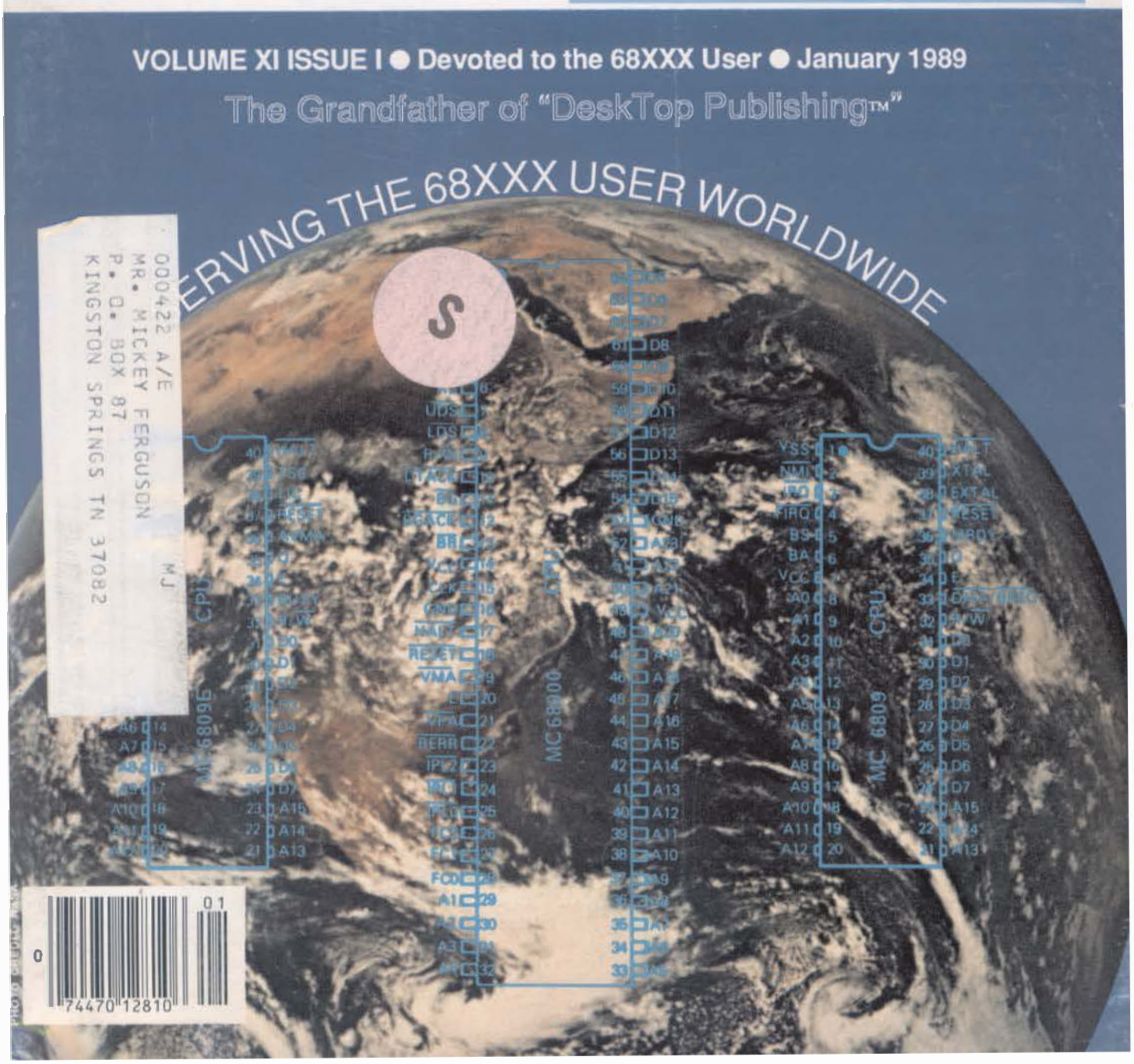
This Issue:

OS-9 SK*DOS Atari Amiga FLEX Macintosh *A User Contributor Journal* And Lots More!

VOLUME XI ISSUE I ● Devoted to the 68XXX User ● January 1989

The Grandfather of "DeskTop Publishing™"

SERVING THE 68XXX USER WORLDWIDE



0 74470 12810 01

WHO DO YOU CALL WHEN YOUR DEBUGGER WON'T DEBUG?

The problem with most real-time operating systems is simple, they're not an integrated solution. You end up dealing with a multitude of suppliers for languages, compilers, debuggers and other important development tools. And when something does go wrong, it can be a frustrating experience trying to straighten out the mess.

Why Not Try the Microware One-Stop Total Solution?

Microware's OS-9 Real-Time Operating System is a total integrated software system, not just a kernel. We offer an extensive set of development tools, languages, I/O and Kernel options. ***And this total integrated solution is entirely designed, built and supported by the same expert Microware team.***

Modularity Lets YOU Choose Just What You Need.

The modular design of OS-9 allows our Operating System to adapt as your requirements change. OS-9 can support a complete spectrum of applications — from embedded ROM-based code in board-level products all the way up to large-scale systems.

The OS-9 Success Kit

A Total Integrated Solution for Your Next Project

Development Tools:
- C Source Level Debugger
- Symbolic Debugger
- System State Debugger
- uMACS Text Editor
- Electronic Mail
- Communications
- Super Shell

Kernel Options:
- MMU (Security Protection) Support
- Math Coprocessor Support

Languages:
- C*
- Basic
- Pascal
- Fortran
- Ada**
- Assembler*

I/O Options:
- SCSI, SASI & SMD Disks
- 3-, 5-, 8-inch Diskettes
- Magnetic Tape
- Ethernet - TCP/IP
- Arcnet - OS-9/Net

*Resident or UNIX versions available
**VAX hosted

Support is Part of the Package.

Microware is proudly setting the industry's standard for customer support. You'll find professional and comprehensive technical documentation and a Customer Hotline staffed by courteous and authoritative software engineers.

So stop messing with simple kernels and independent suppliers. Call Microware today and find out more about the "One-Stop Integrated Solution" with OS-9!

microware® OS-9

Microware Systems Corporation
1900 N.W. 114th Street
Des Moines, Iowa 50322
Phone: 515/224-1929

Western Regional Office
4401 Great America Parkway
Santa Clara, California 95054
Phone: 408/980-0201

Microware Japan Ltd.
41-19 Honcho 4-Chome
Funabashi City
Chiba 273, Japan
Phone: 0474 (22) 1747

Mustang-020 Mustang-08 Benchmarks

	32 bit Integer	Register Long
IBM AT 7300 Xenix Sys 3	9.7	
AT&T 7300 UNIX PC 68010	7.2	4.3
DEC VAX 11/780 UNIX Berkley 4.2	3.6	3.2
DEC VAX 11/750 " "	5.1	3.2
68008 OS-9 68K 8 Mhz	18.0	9.0
68000 OS-9 68K 10 Mhz	6.5	4.0
MUSTANG-08 68008 OS-9 68K 10 Mhz	*9.8*	*6.3*
MUSTANG-020 68020 OS-9 68K 16 Mhz	*2.2*	*0.88*
MUSTANG-020 68020 MC68881 UniFLEX 16 Mhz	*1.8*	*1.22*

```
Main()
        {
            register long i;
            for (i=0; i < 999999; ++i);
        }
```

Estimated MIPS - MUSTANG-020 — 4.5 MIPS,
Burst to 8 - 10 MIPS: Motorola Specs

Mustang Specifications

12.5 Mhz (optional 16.6 Mhz available) MC68020 full 32-bit wide path
32-bit wide data and address buses, non-multiplexed
on chip instruction cache
object code compatible with all 68XXX family processors
enhanced instruction set - math co-processor interface
68881 math hi-speed floating point co-processor (optional)
direct extension of full 68020 instruction set
full support IEEE P754, draft 10.0
transcendental and other scientific math functions
2 Megabyte of SIP RAM (512 x 32 bit organization)
up to 256K bytes of EPROM (64 x 32 bits)
4 Asynchronous serial I/O ports standard
optional to 20 serial ports
standard RS-232 interface
optional network interface
buffered 8 bit parallel port (1/2 MC68230)
Centronics type pinout
expansion connector for I/O devices
16 bit data path
256 byte address space
2 interrupt inputs
clock and control signals
Motorola I/O Channel Modules
time of day clock/calendar w/battery backup
controller for 2, 5 1/4" floppy disk drives
single or double side, single or double density
35 to 80 track selectable (48-96 TPI)
SASI interface
programmable periodic interrupt generator
interrupt rate from micro-seconds to seconds
highly accurate time base (5 PPM)
5 bit sense switch, readable by the CPU
Hardware single-step capability

Don't be mislead! ONLY Data-Comp delivers the Super MUSTANG-020

OS-9

OS-9 Professional Ver *Includes C Compiler	$850.00
Basic09	300.00
C Compiler	500.00
68000 Disassembler (w/source add: $100.00)	100.00
Pascal 77	750.00
Microware Pascal	500.00
Oregonsoft Pascal	900.00
Stylo-Graph	495.00
Stylo-Spell	195.00
Stylo-Merge	175.00
Stylo-Graph-Spell-Merge	695.00
PAT w/C source	229.00
JUST w/C source	79.95
PAT/JUST Combo	249.50
Sculptor+ (see below)	995.00
COM	125.00

UniFLEX

UniFLEX (68020 ver)	$450.00
Screen Editor	150.00
Sort-Merge	200.00
BASIC/PreCompiler	300.00
C Compiler	350.00
COBOL	750.00
CMODEM w/source	100.00
TMODEM w/source	100.00
X-TALK (see Ad)	99.95
Cross Assembler	50.00
Pascal 77	450.00
Sculptor+ (see below)	995.00
Standard MUSTANG-020™ shipped 12.5 Mhz.	
Add for 16.6 Mhz 68020	375.00
Add for 16.6 Mhz 68881	375.00
Add for 20 Mhz 68020/RAM	750.00
16 Port exp. RS-232	335.00
Requires 1 or 2 Adapter Cards below RS232 Adapter	165.00
Each card supports 4 additional ser. ports (total of 36 serial ports supported)	
60 line Parallel I/O card	398.00
Uses 3 68230 Interface/Timer chips, 6 groups of 8 lines each, separate buffer direction control for each group.	
Prototype Board	75.00
area for both dip and PGA devices & a pre-wired memory area up to 512K DRAM.	
SBC-AN	475.00
Interface between the system and ARCNET modified token-passing LAN, fiber optics optional - call.	
LAN software drivers	120.00
Expansion for Motorola I/O Channel Modules	$195.00
Special for complete MUSTANG-020™ system buyers - Sculptor+ $695.00. SAVE $300.00	
Software Discounts	

All MUSTANG-020™ system and board buyers are entitled to discounts on all listed software: 10-70% depending on item. Call or write for quotes. Discounts apply after the sale as well.

The PRO!

Only the "PRO" Version of OS-9 Supported!

This is *HEAVY DUTY* Country!

For a limited time we will offer a $400 trade-in on your old 68XXX SBC. Must be working properly and complete with all software, cables and documentation. Call for more information

These hi-speed 68020 systems are presently working at NASA, Atomic Energy Commission, Government Agencies as well as Universities, Business, Labs, and other Critical Applications Centers, worldwide, where speed, math crunching and multi-user, multi-tasking UNIX C level V compatability and low cost is a must.

Price List:

Mustang-020 SBC		$2490.00
Cabinet w/switching PS		$299.95
5"-80 track floppy DS/DD		$269.95
Floppy Cable		$39.95
OS-9 68K Professional Version		$850.00
C Compiler ($500 Value)		N/C
Winchester Cable		$39.95
Winchester Drive 25 Mbyte		$895.00
Hard Disk Controller		$395.00
Shipping USA UPS		$20.00
UniFLEX	Less	$100.00
MC68881 f/p math processor	Add	$275.00
16.67 Mhz MC68020		$375.00
16.67 Mhz MC68881		$375.00
20 Mhz MC68020 Sys		$750.00
Note all 68881 chips work with 20 Mhz Sys		
	Total:	$5299.80

NEW LOWER PRICES

25 Mbyte HD ~~$4299.80~~ $3749.80

85 Mbyte HD ~~$5748.80~~ $4548.80

Note: Only Professional OS-9 Now Available (68020 Version) Includes ($500) C Compiler - 68020 & 68881 Supported - For UPGRADES Write or Call for Professional OS-9 Upgrade Kit

Data-Comp Division

A Decade of Quality Service™
Systems World-Wide

Computer Publishing, Inc. 5900 Cassandra Smith Road
Telephone 615 842-4601 - Telex 510 600-6630 Hixson, Tn 37343

A Member of the CPI Family

68 Micro Journal

10 Years of Dedication to Motorola CPU Users

6800 6809 68000 68010 68020

The Originator of "DeskTop Publishing™"

Publisher
Don Williams Sr.

Executive Editor
Larry Williams

Production Manager
Tom Williams

Office Manager
Joyce Williams

Subscriptions
Cheryl Hodge

Contributing & Associate Editors

Ron Anderson — Dr. E.M. "Bud" Pass
Ron Voigts — Art Weller
Doug Lurie — Dr. Theo Elbert
Ed Law — & Hundreds More of Us

Contents

68 MICRO JOURNAL

"Contribute Nothing - Expect Nothing" DMW 1986

COMPUTER PUBLISHING, INC.

"Over a Decade of Service"

"World Wide"

68 MICRO JOURNAL
Computer Publishing Center
5900 Cassandra Smith Road
PO Box 849
Hixson, TN 37343

Phone (615) 842-4600 Telex 510 600-6630

68 Micro Journal is the *original* "DeskTop Publishing" product and has continously published since 1978 using only micro-computers and special "DeskTop" software. Using first a kit built 6800 micro-computer, a modified "ball" typewriter, and "home grown" DeskTop Publishing software. None was commercially available at that time. For over 10 years we have been doing "DeskTop Publishing"! *We originated what has become traditional "DeskTop Publishing"!* Today 68 Micro Journal is acknowledged as the "Grandfather" of "DeskTop Publishing" technology.

---

68 Micro Journal (ISSN 0194-5025) is published 12 times a year by Computer Publishing Inc. Second Class Postage paid at Hixson, TN. and additional entries. POSTMASTER: send address changes to 68 Micro Journal, POB 849, Hixson, TN 37343.

Subscription Rates

1 Year $24.50 USA, Canada & Mexico $34.00 a year. Others add $12.00 a year surface, $48.00 a year Airmail. USA funds. 2 years $42.50, 3 years $64.50 plus additional postage for each additional year.

Items or Articles for Publication

Articles submitted for publication must include authors name, address, telephone number, date and a statement that the material is original and the property of the author. Articles submitted should be on diskette, OS-9, SK*DOS, FLEX, Macintosh or MS-DOS. All printed items should be dark type and satisfactory for photo-reproduction. No blue ink! No hand written articles - please! Diagrams o.k.

Please - do not format with spaces any text indents, charts, etc. (source listing o.k.). We will edit in all formatting. Text should fall flush left and use a carriage return only to indicate a paragraph end. Please write for free authors guide.

Letters & Advertising Copy

Letters to the Editor should be the original copy, signed! Letters of grip as well as praise are acceptable. *We reserve the right to reject any letter or advertising material, for any reason we deem advisable.* Advertising Rates: Commercial please contact 68 Micro Journal Advertising Department. Classified advertising must be non-commercial. Minimum of $15.50 for first 15 words. Add $.60 per word thereafter. No classifieds accepted by telephone.

PAT - JUST

PAT

With 'C' Source

$229.00

All OS-9 68XXX Systems

PAT FROM S. E. MEDIA -- A FULL FEATURED **SCREEN ORIENTED TEXT EDITOR** with all the best of PIE. For those who swore by and loved **PIE**, this is for **YOU! All PIE features & much more!** Too many features to list. And if you don't like ours, change or add your own. **C source included**. Easily configured to your CRT terminal, with special configuration section. No sweat!

68008 - 68000 - 68010 - 68020 OS-9 68K $229.00

COMBO PAT/JUST

Special $249.00

JUST

JUST from S. E. MEDIA - - Text formatter written by Ron Anderson; for dot matrix printers, provides many unique features. Output formatted to the display. User configurable for adapting to other printers. Comes set-up for Epson MX80 with Graflex. Up to 10 imbedded printer control commands. Compensates for double width printing. Includes normal line width, page numbering, margin, indent, paragraph, space, vertical skip lines, page length, centering, fill, justification, etc. Use with **PAT** or any other text editor. The ONLY stand alone text processor for the 68XXX OS-9 68K, that we have seen. And at a very **LOW PRICE!** Order from: S.E. MEDIA - see catalog this issue.

68008 - 68000 - 68010 - 68020 OS-9 68K
With 'C' source $79.95

C

The C Programmers Reference Source. Always Right On Target!

C User Notes

A Tutorial Series

By: Dr. E. M. 'Bud' Pass
1454 Latta Lane N.W.
Conyers, GA 30207
404 483-1717/4570
Computer Systems Consultants

INTRODUCTION

This chapter concludes the presentation of a binary file editor and discusses certain problems with the techniques by which standard C language compilers perform computations

C COMPUTATIONS

As with many other detailed aspects of the C language, the standards leave many specifics of computations to the implementor. It is the programmer's responsibility to be aware of and avoid the common traps.

Since division of integers is always performed in integer mode, the division of a smaller number by a larger number (in absolute value) will always produce zero. Computations must be properly arranged to ensure that incorrect results are not produced because of division truncation.

Thus, the expression (A * B / C) should usually be stated as ((A * B) / C), not as (A * (B / C)), so that a larger value will be generated by the multiplication operation before the division operation is performed. This will ensure more accurate results.

For example, ((3 * 4) / 5) = 2, but (3 * (4 / 5)) = 0, using integer arithmetic and division truncation, not rounding.

Assuming that the multiplication operation will be performed before the division operation, in the absence of parentheses, will lead to incorrect results on some implementations. Thus, (3 * 4 / 5) may be 0 or 2, depending upon the implementation.

Unfortunately, performing multiplications before division does not necessarily solve the problem. Most C compilers will promote the operations of an expression to the type of the highest subexpression, to maintain the accuracy of the expression.

Thus, if A, B, and C above are 16-bit short integers, the expression will have type short int. Most C compilers will recognize that the product of two 16-bit values requires 32 bits to maintain, and will perform the multiplication and division using 32-bit operations.

However, if the subexpressions are 32-bit long integers, many C compilers will not extend the temporary results to 64 bits, as the hardware for 64-bit computations is usually not available on 32-bit machines and the loss of efficiency required to call subroutines to perform the extended precision arithmetic may be considered excessive.

Most C compilers will not even warn the programmer or user that the computation may be or is actually subject to high-order truncation, leading to potentially disastrous situations in which the numbers being used to test an algorithm, but some combinations of actual inputs cause overflow or division by zero, another common problem.

In the 64-bit case, the programmer must determine that this treatment is always adequate for the specific case, specify double-precision floating-point calculations, or perform the extended precision integer operations assuming 32-bit precision. The latter approach may be easily accomplished for addition and subtraction, but the multiply algorithm is somewhat more complex and the divide algorithm is substantially more complex.

The floating-point approach has the disadvantages of loss of speed and of loss of accuracy, in addition to usually making the object program larger, in the majority of cases, due to the floating-point subroutines. Furthermore, floating-point libraries have historically been prone to subtle types of errors of their own, and this approach should be avoided if not essential to the calculations.

Another point of difference among C compilers relates to sign extension. Most C programmers are aware of the sign extension considerations as they relate to variables of type char, since this varies significantly among compilers.

C programmers are usually less aware of the sign extension rules for such arithmetic and logical operations as right shifts. In fact, K & R specified that sign extensions for right shifts are left to the specific implementation. In a

small sample of several compilers, half extended the sign and half did not. Two of the compilers providing different results produced code for the same hardware, showing that the designers of the compilers had different opinions for sign-extending right shifts.

EXAMPLE C PROGRAM

Following is this month's example C program; it is the second part of zap, as discussed earlier. The remainder is presented in the previous chapter.

```
/* search value in file */
search ()
{
    int bt; /* first byte thereof   */
    int chr;
    long first;
    union
    {
        long ll;
        char ss[4];
    }   uu;

    if (!gt_val ("Search for ? ", &uu.ll))
        return;
    if (!gt_val ("Start at   ? ", &sstart))
        return;
    if (!gt_val ("Stop at    ? ", &ennd))
        return;
    /* temporary using first to hold EOF value */
    first = lseek (fileno(zf), 0l, 2);
    if (!ennd)
    {
        if (f_verbose)
        {
            V_fprintf (stderr, "EOF at ");
            V_fprintf (stderr, deffmt[cur_printmode], first);
            V_fprintf (stderr, "\n");
        }
        ennd = first - cur_type + 1;
    }
    if (sstart > ennd)
    {
        remark ("start > end", 0L);
        return;
    }
    if (ennd > first)
    {
        if (f_verbose)
            remark ("end > EOF, truncated", 0L);
        ennd = first;
    }
    /* end of using first to hold EOF value */
#ifndef SEARCH_ACTUAL
    if (fseek (zf, sstart, 0))
    {
        V_fprintf (stderr, "cannot position to ");
        V_fprintf (stderr, deffmt[cur_printmode], sstart);
        V_fprintf (stderr, "\n");
        return;
    }
#endif
    (void) signal (SIGINT, quit_search);
    /* shift to align */
```

```
    if (!swab)
    {
        if (cur_type == BYTE)
            uu.ss[0] = uu.ss[3];
        else
        if (cur_type == WORD)
        {
            uu.ss[0] = uu.ss[2];
            uu.ss[1] = uu.ss[3];
        }
    }
    bt = BYTEVAL(uu.ss[0]);
    first = sstart;
    diddots = interrupted = FALSE;
    while (sstart < ennd)
    {
        /* print a dot for every 1K processed */
        if (!f_silent && (!((first - sstart) & 0x3ff)) && sstart > first)
        {
            V_printf (".");
            (void) fflush (stdout);
            diddots = TRUE;
        }
#ifdef SEARCH_ACTUAL
        /* searching the actual values (very slow) */
        if (get_value (sstart) == bt)
        {
            if (cur_type == BYTE)
                foundit (sstart);
            else
            if (get_value (sstart + 1L) == BYTEVAL(uu.ss[1]))
            {
                if (cur_type == WORD)
                    foundit (sstart);
                else
                if ((get_value (sstart + 2L) == BYTEVAL(uu.ss[2])) &&
                    (get_value (sstart + 3L) == BYTEVAL(uu.ss[3])))
                    foundit (sstart);
            }
        }
        start++;
#else
        /* searching the old contents of the file */
        if (fgetc (zf) == bt)
        {
            if (cur_type == BYTE)       /* looking for byte is easy */
                foundit (sstart);
            else
            {
                chr = fgetc (zf);
                if (chr == BYTEVAL(uu.ss[1]))
                {
                    if (cur_type == WORD)
                    {
                        foundit (sstart);
                        ungetc (chr, zf);
                    }
                    else
                    {
                        chr = fgetc (zf);
                        if (chr == BYTEVAL(uu.ss[2]))
                        {
                            chr = fgetc (zf);
```

```
                        if (chr == BYTEVAL(uu.ss[3]))
                            foundit (sstart);
                    }
                    fseek (zf, sstart + 1L, 0);
                }
            }
            else
                ungetc (chr, zf);
        }
    }
    sstart++;
    if (ferror (zf) || feof (zf))
        quit_search ();
#endif
    )                           /* while (sstart < ennd) */
    if (diddots)
        V_printf ("\n");
    (void) signal (SIGINT, SIG_DFL);
    if (!f_batch && interrupted)
    {
        V_printf ("Interrupted at ");
        V_printf (defffmt[cur_printmode], sstart);
        V_printf ("\n");
    }
}

/* print verification list */
verify ()
{
    long addr;

    /* display all modifications entered until now. display in portions
     * of cur_printmode. align to lower cur_type boundary */
    for (addr = 0l, tbl_ptr = tbl; tbl_ptr != tbl_free; tbl_ptr++)
        if (tbl_ptr->addr >= addr)
        {
            addr = tbl_ptr->addr & ~(cur_type - 1);
            V_printf ("vfy: ");
            V_printf (defffmt[cur_printmode], addr);
            V_printf ("%c %-7s => ", dp_type[cur_type], pr_val (addr, FALSE));
            V_printf ("%-7s\n", pr_val (addr, TRUE));
            addr += cur_type;
        }
}

int gt_line (dst, prompt, arg1, arg2, arg3, arg4)
char *dst;
char *prompt;
long arg1;
long arg2;
char arg3;
char *arg4;
{
    if (prompt && !f_silent)
        V_printf (prompt, arg1, arg2, arg3, arg4);
    (void) fflush (stdout);
    if (!gets (dst))
    {
        if (f_batch && !f_silent)
            V_printf ("[eof]\n");
#ifndef vaxc
        (void) putchar ('\n');
#endif
```

```
        return (NULL);
    }
    if (f_batch && !f_silent)
        V_printf ("%s\n", dst);
    if (dst[0] == '^' && dst[1] == 'Z' && dst[2] == '\0')
        return (FALSE);
    else
        return (TRUE);
}

int gt_val (prompt, l)
char *prompt;
long *l;
{
    *l = 0L;
    while (gt_line (buf, prompt, 0L, 0L, '\0', NULL))
    {
        if (!decod (buf, l))
            return (TRUE);
    }
    return (FALSE);
}


/* display value, using current settings (result is in static area) */
char *pr_val (addr, cur)
long addr;
int cur;            /* 1 = use current, 0 = use previous */
{
    char *cp;
    int i;
    long val;
    static char dst [64];

    last_value = 0;
    if (cur_printmode == ASCII)
    {
        cp = dst;
        for (i = 0; i < cur_type; i++)
        {
            val = getbyte (addr);
            addr++;
            if (val >= ' ' && val < 0177 && val != '\\')
                *cp++ = val;
            else
            {
                *cp++ = '\\';
                switch ((int)BYTEVAL(val))
                {
                case '\b':
                    *cp++ = 'b';
                    break;
                case '\n':
                    *cp++ = 'n';
                    break;
                case '\t':
                    *cp++ = 't';
                    break;
                case '\f':
                    *cp++ = 'f';
                    break;
                case '\r':
                    *cp++ = 'r';
```

```
                break;
            case '\\':
                *cp++ = '\\';
                break;
            default:
                V_sprintf (cp, "%o", val);
                while (*cp)
                    cp++;
                break;
            }
        }
        *cp++ = ' ';
    }
    *cp = '\0';
}
else
{
    val = 0l;
    switch (cur_type)
    {
    case BYTE:
        val = getbyte (addr);
        break;
    case WORD:
        if (swab)
        {
            val =              getbyte (addr + 1L);
            val = (val << 8) | getbyte (addr     );
        }
        else
        {
            val =              getbyte (addr  );
            val = (val << 8) | getbyte (addr + 1L);
        }
        break;
    case LWORD:
        if (swab)
        {
            val =              getbyte (addr + 3L);
            val = (val << 8) | getbyte (addr + 2L);
            val = (val << 8) | getbyte (addr + 1L);
            val = (val << 8) | getbyte (addr     );
        }
        else
        {
            val =              getbyte (addr     );
            val = (val << 8) | getbyte (addr + 1L);
            val = (val << 8) | getbyte (addr + 2L);
            val = (val << 8) | getbyte (addr + 3L);
        }
        break;
    }
    if ((last_value = val) || cur_printmode != OCTAL)
        V_sprintf (dst, deffmt[cur_printmode], val);
    else
        (void) strcpy (dst, "0");
}
return (dst);
}

static char *fmt [] =
{
    "0%05lo  0%05lo%c %-7s ",
```

```
    "%6ld  %6ld%c %-7s ",
    "x%05ld  x%05lx%c %-7s ",
    "0%05lo  0%05lo%c %-7s "
};

zap (fname)
char *fname;
{
    char chr;                   /* scratch                      */
    int check;                  /* checksum value               */
    int checkwrite;             /* check for write access       */
    int goon;                   /* until ^Y is used             */
    int i;                      /* scratch                      */
    int need_head;              /* header toggle                */
    long base;                  /* base of patching sequence    */
    long offset;                /* offset from base             */
    long val;                   /* holding variable for values  */

    checkwrite = TRUE;
    goon = TRUE;
    /* open file */
#ifdef MSDOS
    if (!(zf = fopen (fname, (f_write) ? "rb+" : "rb")))
#else
    if (!(zf = fopen (fname, (f_write) ? "r+" : "r")))
#endif
        cant (fname);
    /* set defaults and allocate table */
    cur_type = BYTE;
    cur_printmode = OCTAL;
    if (!tbl)
    {
        if (!(tbl = (struct ntry *)
            calloc ((unsigned)tbl_max, sizeof (struct ntry ))))
            error ("no room for table");
    }
    tbl_cur = tbl_free = tbl;
    prevcnt = 0;                /* reset previous location table */
    /* loop 1 : loop on Base values */
    while (goon && gt_val ("Base ?    ", &base))
    {
        /* loop 2 : loop on offset values */
        while (goon && gt_val ("Offset ?  ", &offset))
        {
            need_head = TRUE;
            /* loop 3 : loop on patch commands */
            while (goon)
            {
                if (need_head && !f_silent)
                    V_printf ("Base    Offset  Value   New\n");
                need_head = FALSE;
                if (!gt_line (buf, fmt[cur_printmode], base, offset,
                    dp_type[cur_type], pr_val (base + offset, TRUE)))
                    break;
                switch (buf[0])
                {
                case '\0':
                    /* close current, advance and open new location */
                    offset += cur_type;
                    break;
                case '/':
                    /* re-open current using new type */
                    cur_type = WORD;
```

```
        break;
    case '\\':
        /* re-open current using new type */
        cur_type = BYTE;
        break;
    case '|':
        /* re-open current using new type */
        cur_type = LWORD;
        break;
    case '^':
        if (!buf[1])
        {
            /* close current, back up and open new location */
            offset -= cur_type;
            break;
        }
        if (buf[1] != 'Y' || buf[2])
            break;
        /* FALL THROUGH */
    case '\031':    /* ^Y */
        goon = FALSE;
        break;
    case '>':
        /* goto new location */
        if (!decod (&buf[1], &val))
        {
            push_loc (base + offset);
            offset = buf[1] ? val : last_value;
        }
        break;
    case '<':
        /* goto location */
        if (buf[1] == '\0' && prevcnt > 0)
            offset = pop_loc () - base;
        break;
    case ';':
        /* change current display mode ... */
        chr = buf[1];
        if (isupper (chr))
            chr = tolower (chr);
        if (chr == 'o')
            cur_printmode = OCTAL;
        else
        if (chr == 'd')
            cur_printmode = DECIMAL;
        else
        if (chr == 'x')
            cur_printmode = HEX;
        else
        if /* ... or store ascii bytes ... */ (chr == 'a')
        {
            cur_printmode = ASCII;
            for (i = 2; chr = buf[i]; i++)
            {
                if (checkwrite && !f_write)
                {
                    need_head = TRUE;
                    checkwrite = FALSE;
                    remark ("no write access", 0L);
                }
                put_byte (base + offset, chr);
                offset++;
            }
```

```
                }
                else
                if /* ... or print modifications ... */ (chr == 'v')
                {
                    verify ();
                    need_head = TRUE;
                }
                else
                if /* ... or search values */ (chr == 's')
                {
                    search ();
                    need_head = TRUE;
                }
                break;
            default:
                if ((i = decod (buf, &val)) <= 0)
                {
                    if (checkwrite && !f_write)
                    {
                        need_head = TRUE;
                        checkwrite = FALSE;
                        remark ("no write access", 0L);
                    }
                    put_value (base + offset, val);
                    if (!i)
                        offset += cur_type;
                    else
                        offset -= cur_type;
                }
            }
            /* loop on patch commands */
        }
        /* loop on offset values */
    }
    /* loop on base values */
}
/* compute checksum, if requested */
if (f_check || f_sum)
{
    check = 0;
    for (tbl_cur = tbl; tbl_cur != tbl_free; tbl_cur++)
        check ^= (BYTEVAL(tbl_cur->val) |
            ((tbl_cur->old << 8) & 0xff00));
    if (f_sum)
    {
        V_printf ("Checksum = ");
        V_printf (deffmt[cur_printmode], check);
        V_printf ("\n");
    }
}
/* apply patches, after checksum verification */
tbl_cur = tbl;
if (f_write)
{
    /* verify checksum */
    if (f_check)
        while (gt_val ("Checksum ? ", &val))
            if (val == check || f_batch)
                break;
    if (!(f_check && val != check))
        for (tbl_cur = tbl; tbl_cur != tbl_free; tbl_cur++)
            ptv_file (tbl_cur->addr, tbl_cur->val);
}
```

```
    if (tbl_cur != tbl_free)
        error ("no modifications made");
    if (!f_silent && f_write && tbl == tbl_free)
        remark ("no modifications requested", 0L);
    /* close file and exit */
    (void) fclose (zf);
}

cant (s)
char *s;
{
    V_fprintf (stderr, "%s: cannot open %s\n", my_name, s);
    exit (1);
}

remark (s, a)
char *s;
long a;
{
    V_fprintf (stderr, "%s: ", my_name);
    V_fprintf (stderr, s, a);
    V_fprintf (stderr, "\n");
}

error (s)
char *s;
{
    V_fprintf (stderr, "%s: %s\n", my_name, s);
    exit (1);
}

swabcheck ()
{
    union
    {
        short a;
        char a[2];
    } u;
    u.s = 0x1357;
#ifdef SWAB
#if SWAB
    if (!(u.a[0] == 0x57 && u.a[1] == 0x13))
        error ("please recompile with \"-DSWAB=0\"");
#else
    if (!(u.a[0] == 0x13 && u.a[1] == 0x57))
        error ("please recompile with \"-DSWAB=1\"");
#endif
#else
    swab = (u.a[0] == 0x57 && u.a[1] == 0x13);
#endif
}
```

EOF

Basically OS-9

Dedicated to the serious OS-9 user.
The fastest growing users group world-wide!
6809 - 68020

A Tutorial Series

By: Ron Voigts
2024 Baldwin Court
Glendale Heights, IL 60139

PRACTICE WHAT I PREACH

A few days ago I did the cardinal sin at the keyboard. I put the wrong disk in at the wrong time. I was setting up another disk with some files. The label on the new disk is identical to the one I keep this column on. With nothing but a brief glance I tossed the column's disk into drive /d1 and entered the line:

format /d1 "Files Disk" r

Well it was all over column was gone! It was a memory. Weeks of work was gone.

The sin was not formatting the wrong disk. I believe it could happen to anyone. Even the best of intentions go bad. The sin was I had no backup disk. And to add to the injury, I had not even made a hardcopy. I know what you are saying, "Ron, what happened to all the preaching about making backups?" Well, all I can say is that I'm guilty. I did not practice what I preached and I paid the price. Now, I'm back to backing up my files.

THE CURRENT STATE OF BASICALLY OS-9

This explanation does not explain why you did not see a column last month. I feel I should explain. To put it bluntly, I have gone to bi-monthly basis. I don't know for how long I will be doing it this way, but for now expect the column every other month.

I should explain some of my reasons for the change. One reason is monthly burn-out. Yes, it is catching up with me. Or maybe it is old age. This column will be 4 years old this coming April and that is a long time. I tip my hat to the old timers writing in the magazine, like Ron Anderson and Dr. E. M. Pass. I certainly we cannot forget Don Williams Sr and his staff. How those guys have done it for 10+ years is beyond me.

Another problem is finding time to get the column out. I really don't where time goes. Einstein said that time is relative. It is like being on a date with a beautiful woman. Time will speed along. The following week while waiting for her to call you, time will creep along. (Female readers please insert "handsome man" for the "beautiful woman".)

I have a few other reasons, but at this time wish not to divulge them. Hopefully as time goes on things will get back to normal and I will once again bring the column back to a monthly basis.

3 YEARS OF PROGRAMS FOR SALE

I have been also at work on a side project for the past few months and now am ready to unvail it. As many of you know this column has been in existence for some 3+ years. It started back in April 1985. This coming April will in fact mark its 4 year anniversary.

There is some history to the column. Originally it was titled Basic OS-9. My task was to write a beginners column on OS-9 helping new comers adjusted and get into the swing of things. I tired to cover as much as I could. I covered programming languages, operating systems, micropressesor theory and stories of my encounters in the world of computer technology. Yes, I also covered OS-9. After some months of writing the column, I received a call from Don Williams. It was a tuesday evening. Don said that he liked the column, saw a strong future for it and thought the name was not adequate. Not only was I covering beginner OS-9, I was coverering everything else. So we changed the column's name to Basically OS-9.

I had a number of philosophies on what I should write about. My main goal was always to enlighten the reader. I thought of it as feeding my readers. In fact one column was even titled "OS-9 Smorgasbord." I wanted to do one thing in every column. I wanted to present a program each time. My belief was that a program was worth far more than all the rambling I could do. I found the computer magazines that only talk and present nothing to do get boring very fast. So almost every column has some piece of related software.

The software covered all the types of languages. I presented programs in Basic09, Pascal, C Language, Assembler, and Kbasic. Some programs were food for thought, while others were stand alone. The programs covered a large variety of things. To name a few: directory alphabitizer, checkbook balancer, a new DATE program, a simultaneous equation solver and new LIST program.

For the past few months, I have been going through my old files findingall the source codefrom APRIL 1985 through MARCH 1988. I have just finished the task and put them into a 3 Volume set, one for each year of the column. I have al so taken care of putting them into a useful form. I have packed, compiled and assembled the code. So, the disks not only contain the source code, the also have the I-Code, P-Code, or 6809 object code. The are ready to run. You will need the Basic09 or Pascal runtime libraries.

Here is a list of what is on the disks.

```
VOLUME 1 - 1985 TO 1988
1.   APRIL      BSORT      BASIC09
2.   APRIL      SORT       BASIC09
3.   MAY        PAD        BASIC09
4.   JUNE       PDISPLAY   BASIC09
5.   JUNE       FF         ASSEMBLY
6.   JULY       DISKID     BASIC09
7.   AUGUST     DISKLOOK   BASIC09
8.   SEPTEMBER  CRYPT      C
9.   OCTOBER    RABBITS    PASCAL
10.  NOVEMBER   DALPHA     C
11.  DECEMBER   DNC        C
12.  JANUARY    CHECKING   PASCAL
13.  FEBRUARY   DATE       ASSEMBLY
14.  MARCH      FLOOK      BASIC09

VOLUME 2 - 1986 TO 1987
1.   APRIL      DALPHA     C
2.   MAY        MATRIX     C
3.   JUNE       PACK       ASSEMBLY
4.   JUNE       UNPACK     ASSEMBLY
5.   JULY       GETIME     ASSEMBLY
6.   JULY       SORT       C
7.   AUGUST     SYSGEN     BASIC09
8.   SEPTEMBER  ATTACH     ASSEMBLY
9.   OCTOBER    NEWTONS1   KBASIC
10.  OCTOBER    NEWTONS2   KBASIC
11.  NOVEMBER   TREES      PASCAL
12.  JANUARY    DEVICES    KBASIC
13.  FEBRUARY   STRIP      C
14.  MARCH      WRAP       C

VOLUME 3 - 1987 TO 1988
1.   APRIL      HCHECK     BASIC09
2.   MAY        LIST       C
3.   JULY       PCOPY      BASIC09
4.   AUGUST     DOUBLE.V1  C
5.   AUGUST     DOUBLE.V2  C
6.   SEPTEMBER  OPTEST     C
7.   OCTOBER    DATE       C
8.   NOVEMBER   GETMODDIR.V1 BASIC09
9.   NOVEMBER   GETMODDIR.V2 BASIC09
10.  DECEMBER   EQUATIONS  PASCAL
11.  JANUARY    SYSGO.V1   ASSEMBLY
12.  JANUARY    SYSGO.V2   ASSEMBLY
13.  FEBRUARY   PLIST      C
14.  MARCH      PATH       C
```

As you can see there is listed over 42 programs. As it turns out this list can be misleading. Some of the Basic09 programs are really a number of procedures inbedded in one file. The program OPTEST is really a test for a C module which returns the parameters from the input line. Some of them are samples to be used as examples. All the source code is provided on this 3 disk collection. ***These can be purchased from South East Media, $9.95 any single volume or $24.95 for all 3. All non-USA orders must add an additional $3.50 for surface mailing or $6.00 for airmail.***

AND NOW A SELECTION FROM THE MENU

As many of know I am not one for menu driven systems. I pefer to work in an interactive envrionment. I like the feel of entering some cryptic looking command and seeing some type of result. Perhap this enchant is what scares of meny people. I like the challenge of learning and experimenting.

Unfortanely this scares off many potential computer user. Also businesses cannot really invest the time it takes for a person to learn a system. Therefore, a menu driven system is usefull. It is quick and easy to learn. It virtually guides the user through to his final destination.

This month I am presenting a menu system that can be implemented on any OS-9 systems. It may requires a few minot adjustments, but nothing major. This the first version and I can honestly say that it may not be fully debugged. It is a diamond in the rough. It is up to you to polish it.

Listing 1 has the procedure for creating menus. Listing 2 is the actual menu program. Everything is written in Basic09 and should easy to understand. Let me however explain the theory of how the menus are used.

The directory "/DD/MENU" should be created. If you do not havea /DD, defaultdirectory, in you system this can be changed to /D0, /D1, /H0 or whatever. Just remember to change the program accordingly.

The menus are file contained in their directory. Each file consists of a menu title, number of entries and the actual entries. The menu can consist of eithercommands or lower level menus. Let me explain better by telling the construction of an entry.

The entry consists of 4 parts. First is the category. At this point there are only two types. If a 1 is encountered for category, then the entry is for an OS-9 commands or atleast something a SHELL can run. If it is 2, then another menu is being called up.

Second is whether a parameter is required. For menus this not necessary. However, for a command it may required. Consider the menu line "Directory". It would be executed using the command DIR which can use some type of parameter. Parameter is a boolean which is set either TRUE or FALSE.

Third is the menu line. This is what is displayed. It is what the user sees. It gives a hint of what might happen. It can be like the command shown above. Or it might be another menu like "Word Processing Menu".

Finally is the actual command line. This is what gets processed. It can be command or a menu file found in "/DD/MENU". For the last two examples, they would be "DIR" and "WP_FILE", respectively.

Let us look at an example.

FILE: main TITLE: Main OS-9 Menu ENTIRES: 3 ENTRY 1 CATEGORY: 2 PARAMETER: NO MENU LINE: Word Processing Menu COMMAND: WP_FILE ENTRY 2 CATEGORY: 1 PARAMETER: YES MENU LINE: Directory COMMAND: DIR ENTRY 3 CATEGORY: 1 PARAMETER: NO MENU LINE: Shell COMMAND:

FILE: WP_FILE TITLE: Word Processing Menu ENTRIES: 3 ENTRY 1 CATEGORY: 2 PARAMETER: YES MENU LINE: Standard OS-9 Editor COMMAND: edit ENTRY 2 CATEGORY: 2 PARAMETER: NO MENU LINE: Stylo COMMAND: stylo ENTRY 3 CATEGORY: 2 PARAMETER: NO MENU LINE: DynaStar COMMAND: ds

I think the best way to get to learn how menu works is to type them up, try the example I have given you and see it in action. Please, make changes if you wish. I am considering making a fancier version of this in C or assembly lanuguage. Maybe some body out there is willing to give it a try.

That is it for this column. We'll see you next time.

LISTING 1

PROCEDURE make_menu

```
0000      (* ****************************
001E      (*
0021      (* Name: Make_Menu
0033      (* By: Ron Voigts
0044      (* Date: 3-NOV-88
0055      (*
0058      (* ****************************
0076      (*
0079      (* Version 1.0         Original
0098      (*
009B      (* ****************************
00B8      (*
00BB      (*
00BE
00BF      (* Set up complex data type
00DA    TYPE entry_type=category:INTEGER; parameter:BOOLEAN; menu_line:STRING[64]; command:STRING[64]
0101
0102      (* Set up variables
0115      DIM s:STRING[32]
0121      DIM path:BYTE
0128      DIM title:STRING[64]
0134      DIM esize:INTEGER
013B      DIM entry(10):entry_type
0149
014A      (* Get file name
015A      INPUT "Enter file name: ",s
0173      (* Create it in directroy "/dd/menu"
0197      CREATE #path,"/dd/menu"+s:WRITE
01AE      PRINT
01B0
01B1      (* Get menu title
01C2      INPUT "Enter menu title: [64]: ",title
01E2      PUT #path,title
01EC      PRINT
01EE
01EF      (* How many entries?
0203      INPUT "Enter number of entries: [10]: ",esize
022A      PUT #path,esize
```

```
0234
0235      (* Get the the information for each item
025D      FOR i:=1 TO esize
0270        PRINT
0272        PRINT "Entry - ",i
0283        PRINT
0285        INPUT "Enter category: ",entry(i).category
02A5        PRINT
02A7        INPUT "Parameter?  (Y/N): ",s
02C2        IF LEFT$(s,1)="Y" OR LEFT$(s,1)="y" THEN
02DD          entry(i).parameter:=TRUE
02EB        ELSE
02EF          entry(i).parameter:=FALSE
02FD        ENDIF
02FF        PRINT
0301        INPUT "Enter menu line: [64]: ",entry(i).menu_line
0328        PRINT
032A        INPUT "Enter command: [32]: ",entry(i).command
034F        PUT #path,entry(i)
035E      NEXT i
0369      CLOSE #path
036F      END
0371
```

LISTING 2

PROCEDURE menu

```
0000      (* ****************************
001E      (*
0021      (* Name: Menu
002E      (* By: Ron Voigts
003F      (* Date: 3-NOV-88
0050      (*
0053      (* ****************************
0071      (*
0074      (* Version 1.0         Original
0093      (*
0096      (* ****************************
00B3      (*
00B6      (* Include following modules:
00D3      (* 1. Get_Menu
00E1      (* 2. Screen
00ED      (* 3. Blanks
00F9      (* 4. Run_Shell
0108      (* 5. Choice
0114
0115      (* Set up complex data type
0130    TYPE entry_type=category:INTEGER; parameter:BOOLEAN; menu_line:STRING[64]; command:STRING[64]
0157
0158      (* Set up variables
016B      DIM entry(10):entry_type
0179      DIM title:STRING[64]
0185      DIM level:INTEGER
018C      DIM file:STRING[64]
0198      DIM esize:INTEGER
019F      DIM i:INTEGER
01A6      DIM menu_stack(8):STRING[64]
01B7
01B8      (* The first file will always be "main"
01DF      file:="main"
01EA
01EB      (* Get the "main" menu
```

```
0201      RUN get_menu(file,title,esize,entry)
021A
021B      (* This is level 1
022D      level:=1
0234
0235      (* Main program loop with exit except CNTRL-C
0262      LOOP
0264
0265        (* Print the screen
0278        RUN screen(title,level,esize,entry)
0291
0292        (* Get user's choice
02A6        RUN get_choice(i)
02B0
02B1        (* If i=0 then we are backing out one level
02DC        IF i=0 THEN
02E8
02E9          (* Can't back up further than level 1
030E          IF level=1 THEN
031A            level:=1
0321          ELSE
0325
0326            (* Else we go back a level and get the menu
0351            level:=level-1
035C            file:=menu_stack(level)
0367            RUN get_menu(file,title,esize,entry)
0380          ENDIF
0382        ELSE
0386
0387          (* Process a direct command
03A2          IF entry(i).category=1 THEN
03B4            RUN run_shell(entry(i))
03C1          ENDIF
03C3
03C4          (* Proces another menu
03DA          IF entry(i).category=2 THEN
03EC            file:=entry(i).command
03FA            RUN get_menu(file,title,esize,entry)
0413            menu_stack(level):=file
041F            level:=level+1
042A          ENDIF
042C
042D          (* Must be a mistake!!
0443          IF entry(i).category<1 OR entry(i).category>2 THEN
0462            PRINT
0464            PRINT "Bad Menu Entry!"
0477            PRINT CHR$(7)
047C          ENDIF
047E        ENDIF
0480      ENDLOOP
0484      END
0486
```

PROCEDURE get_menu

```
0000      (* Read menu file from "/dd/menu"
0022      (* Set up complex data type
003D      TYPE entry_type=category:INTEGER; parameter:BOOLEAN; menu_line
             :STRING[64]; command:STRING[64]
0064
0065      (* Passed arguments
0078      PARAM file:STRING[32]
0084      PARAM title:STRING[64]
```

```
0090      PARAM esize:INTEGER
0097      PARAM entry(10):entry_type
00A5
00A6      (* Set up variables
00B9      DIM i,path:INTEGER
00C4
00C5      (* Get file from "/dd/menu"
00E0      OPEN #path,"/dd/menu/"+file:READ
00F8
00F9      (* Get menu title
010A      GET #path,title
0114
0115      (* Get menu size
0125      GET #path,esize
012F
0130      (* Get menu entries
0143      FOR i:=1 TO esize
0154        GET #path,entry(i)
0162      NEXT i
016D      END
016F
```

PROCEDURE screen

```
0000      (* Print the screen
0013      (* Complex data type
0027    TYPE entry_type=category:INTEGER; parameter:BOOLEAN; menu_line:STRING[64]; command:STRING[64]
004E
004F      (* Passed arguments
0062      PARAM title:STRING[64]
006E      PARAM level:INTEGER
0075      PARAM esize:INTEGER
007C      PARAM entry(10):entry_type
008A
008B      (* Set up the variables
00A2      DIM i:INTEGER
00A9      DIM ssize:INTEGER
00B0
00B1      (* Screen width
00C0      ssize:=64
00C7
00C8      (* Clear screen and home cursor
00E7      PRINT CHR$(12)
00EC      PRINT
00EE      PRINT
00F0
00F1      (* Print first line
0104      RUN blanks((ssize-LEN(title))/2)
0115      PRINT title
011A      PRINT
011C
011D      (* Print second line
0131      PRINT DATE$;
0135      RUN blanks(ssize-20)
0141      PRINT USING "'Level ',I3",level
0155      PRINT
0157      PRINT
0159
015A      (* Print menu choices
016F      FOR i:=1 TO esize
0180        PRINT " ";
0186        PRINT USING "i3"; i;
0192        PRINT ". "; entry(i).menu_line
```

```
01A2      NEXT i
01AD      END
01AF

PROCEDURE blanks

0000      (* Print specified number of blanks
0023      PARAM i:INTEGER
002A      DIM j:INTEGER
0031      FOR j:=1 TO i
0042        PRINT " ";
0048      NEXT j
0053      END
0055

PROCEDURE get_choice

0000      (* Gets user's choice returning an integer
002A      PARAM i:INTEGER
0031      PRINT
0033      PRINT
0035      INPUT "Choice: ( 0 to Backup) : ",i
0056      END
0058

PROCEDURE run_shell

0000      (* Routine to run a command
001B    TYPE entry_type=category:INTEGER; parameter:BOOLEAN; menu_line:STRING[64]; command:STRING[64]
0042      PARAM e:entry_type
004B      DIM s:STRING[64]
0057      PRINT
0059      PRINT "Command: ",e.command
006D      PRINT
006F      IF e.parameter THEN
007B        INPUT "Enter parsmter: ",s
0093      ENDIF
0095      SHELL e.command+" "+s
00A5      PRINT
00A7
00A8      (* Built in PAUSE feature
00C1      INPUT "Type <RETURN> to continue!",s
00E3      END

+++
```

Logically Speaking

The Mathematical Design of Digital Control Circuits

Most of you will remember Bob from his series of letters on XBASIC. If you like it or want more, let Bob or us know. We want to give you - *what you want!*

By: R. Jones
Micronics Research Corp.
33383 Lynn Ave., Abbotsford, B.C.
Canada V2S 1E2

SOLUTIONS TO TEST THIRTEEN

1a.

A	B	C	D	
0	0	0	1	1
0	0	1	0	1
0	1	1	1	3
1	0	0	0	1
1	1	0	1	3
1	1	1	0	3
3	3	3	3	

A	B	C	D	
0	0	0	1	1
0	0	1	0	1
1	0	0	0	1
1	0	1	1	

S_2^a AB'CD
(1a)

A	B'	C	D	
0	1	0	1	2
0	1	1	0	2
0	0	1	1	2
1	1	0	0	2
1	0	0	1	2
1	0	1	0	2
3	3	3	3	

FIGURE T13S.1A

1b./**

A	B	C	D	
0	0	0	0	0
0	1	0	1	2
0	1	1	0	2
1	0	0	1	2
1	0	1	0	2
1	1	1	1	4

A	B	C	D	
0	1	0	1	2
0	1	1	0	2
1	0	0	1	2
1	0	1	0	2
2	2	2	2	

A'	B	C	D	
1	0	0	0	1
1	1	0	1	3
1	1	1	0	3
0	0	0	1	1
0	0	1	0	1
0	1	1	1	3
3	3	3	3	

A'	B	C	D	
1	0	0	0	1
0	0	0	1	1
0	0	1	0	1
1	0	1	1	

A'	B'	C	D	
1	1	0	0	2
1	0	0	1	2
1	0	1	0	2
0	1	0	1	2
0	1	1	0	2
0	0	1	1	2
3	3	3	3	

S_3^a A'B'CD
(1b)

FIGURE T13S.1B

2.

A	B	C	D	E	
0	0	0	1	0	1
0	0	1	0	0	1
0	0	1	1	1	3
0	1	1	1	0	3
1	0	0	0	0	1
1	0	0	1	1	3
1	0	1	0	1	3
1	1	0	1	0	3
1	1	1	0	0	3
1	1	1	1	1	5
6	4	6	6	4	

A	B	C	D	E
0	0	0	1	0
0	0	1	0	0
1	0	0	0	0
1	0	1	1	0

S_3^5 AB'CDE'
(2)

A	B'	C	D	E'	
0	1	0	1	1	3
0	1	1	0	1	3
0	1	1	1	0	3
0	0	1	1	1	3
1	1	0	0	1	3
1	1	0	1	0	3
1	1	1	0	0	3
1	0	0	1	1	3
1	0	1	0	1	3
1	0	1	1	0	3
6	6	6	6	6	

FIGURE T13S.2

3.

A	B	C	D	E	F	
0	0	0	1	1	0	2
0	0	1	0	0	1	2
0	1	0	0	1	0	2
0	1	0	1	0	0	2
0	1	0	1	1	1	4
0	1	1	1	1	0	4
1	0	0	0	0	1	2
1	0	1	0	0	0	2
1	0	1	0	1	1	4
1	0	1	1	0	1	4
1	1	0	1	1	0	4
1	1	1	0	0	1	4
6	6	6	6	6	6	

A	B	C	D	E	F
0	0	0	1	1	0
0	0	1	0	0	1
0	1	0	0	1	0
0	1	0	1	0	0
1	0	0	0	0	1
1	0	1	0	0	0
2	2	2	2	2	2

A'	B	C	D	E	F	
1	0	0	1	1	0	3
1	0	1	0	0	1	3
1	1	0	0	1	0	3
1	1	0	1	0	0	3
1	1	0	1	1	1	5
1	1	1	1	1	0	5
0	0	0	0	0	1	1
0	0	1	0	0	0	1
0	0	1	0	1	1	3
0	0	1	1	0	1	3
0	1	0	1	1	0	3
0	1	1	0	0	1	3
6	6	6	6	6	6	

A'	B	C	D	E	F
0	0	0	0	0	1
0	0	1	0	0	0
0	0	1	0	0	1

A'	B	C'	D	E	F'	
1	0	1	1	1	1	5
1	0	0	0	0	0	1
1	1	1	0	1	1	5
1	1	1	1	0	1	5
1	1	1	1	1	0	5
1	1	0	1	1	1	5
0	0	1	0	0	0	1
0	0	0	0	0	1	1
0	0	0	0	1	0	1
0	0	0	1	0	0	1
0	1	1	1	1	1	5
0	1	0	0	0	0	1
6	6	6	6	6	6	

$S_{1,5}^6$ A'BC'DEF'
(3)

Remember that it's possible you made different choices from me when it came to selecting columns to doubly-complement, but you should at least end up with an equivalent symmetric function.

Mile 17 - heading for Mile 18

Last time we were together I promised that you'd meet the "daddy" of symmetric functions, so here he is, the fellow who's going to enable you to design

ITERATIVE NETWORKS

Symmetric circuits form part of a larger class of circuitry known as "iterative" or "re-iterative" networks, so called because there's a basic pattern to them, which repeats itself. ALL iterative networks (including symmetric) can be designed by the technique to which you'll shortly be introduced, though in the case of the sub-class, symmetric circuits, it's more usual to do so by the methods we've already studied.
Another sub-class of iterative networks is called "positional circuits", and deals with the position, or physical relationship, of the relays in the network, rather than just the number of relays operated. From now on it's to be understood that when we speak of "a circuit of 20 relays ... ", or any other number for that matter, they'll be lettered (or numbered) consecutively. A "set" is a group of consecutively lettered (numbered) relays, and it's with sets of different types that we'll be dealing next. I think it goes without saying that there MUST be at least one unoperated relay between one set and another. I mention this only because I've sometimes been asked whether, say, relays 4, 5 and 6 could be regarded as a set, and relays 7, 8 and 9 as another. By definition these constitute ONE set, as they follow consecutively without a break. Got it so far? Good! Now let's look at typical circuit specifications that we may be asked to design.

1. A circuit of 50 relays is to be closed if, and only if, one set of exactly 3 relays is operated, and all other relays are unoperated.

NOTE: It's common practice in switching theory and other related branches of mathematics to use the word "iff" to mean "if, AND ONLY IF ... ", so we'll adopt this convention from now on.

2. A circuit of 98 relays is to be closed iff ALL sets contain exactly 3 operated relays, otherwise no output.

3. A circuit of 457 relays is to be closed iff there are exactly 2 sets of relays operated, one set to contain 2 relays and the other 3 relays, but not necessarily in that order.

4. A circuit of 153 relays is to be closed iff there are exactly 3 sets of operated relays, no matter how many relays in each set.

Doesn't example 3 look frightening? 457 relays! Wow!! But there's no need to worry, as I can assure you that the circuit is just as easy to design whether there are 45, 457 or 457983 relays involved. In designing positional iterative networks, we're not concerned with how many relays there are, as our whole attention will be focussed on one "prototype" relay somewhere along the chain. We usually picture our prototype as being somewhere about the middle of the chain, that is if we think of its position at all, though it doesn't have to be so.
By convention we call our prototype relay "X", and instead of thinking about relay contacts, we now think in terms of input-lines bringing information into X about conditions in the lower-numbered relays. We also imagine an equal number of output-lines leaving X, and passing on information to the next relay, Y, about conditions UP TO AND INCLUDING X ITSELF. The output-lines of relay-X are, of course, the input-lines of relay-Y.

ITERATIVE NETWORKS - EXAMPLE 1

As a first step in learning our new design process, let's take spec-1 above and try to design this circuit, beginning with Diagram 88a. On our squared pad, we set up two columns, headed X=0 and X=1, X being our prototype relay. Immediately to the left of the X=0 column we write the code "0", and further out to the left again (under a heading "Relays Operated" we write a second "0". The left-hand 0 is interpreted as "No relays operated so far", and the 0 in the Code column is simply our code for this condition. This is the lowest level, or simplest piece of information possible!

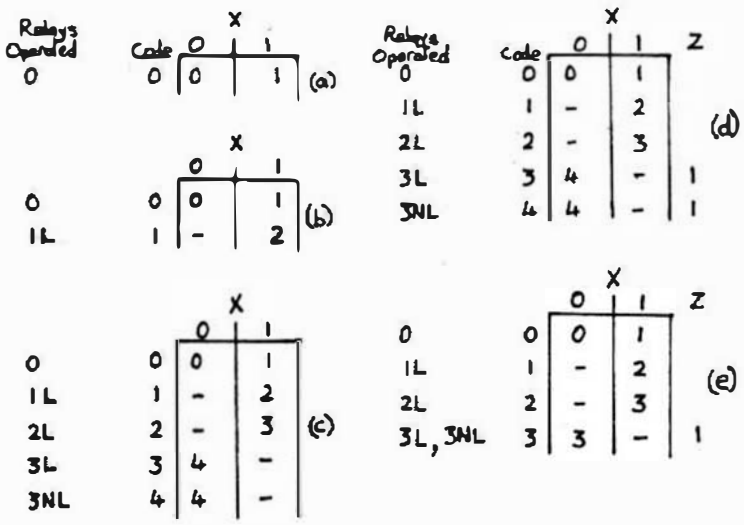


Diagram 88

Now let's look at the X=0 column of Code-0 in 88a. With information 0 coming in to X, and X itself unoperated, it, too, must obviously pass on the same information to relay-Y (namely, "No relays operated to this point"), which fact we record by entering a 0 in this column. On the other hand, moving to the X=1 column, if relay-X IS operated, it must pass on to relay-Y the information that the relay immediately in front of Y is operated, and that it's the only one so far. Let's give this the code 1, to stand for "one relay operated immediately before you" and insert this code in the X=1 column. Normally we abbreviate this long statement to "1L", for 1-LAST, meaning "one relay operated, and it's the last one in the chain to this point".

Of course, if it's possible for X to pass this info on to Y, it's also possible for similar news to come into X from ITS previous relay. So as we haven't defined what our response will be to Code-1, let's open up a new line, as in 88b, with 1L at the extreme left, and its code "1" in the code column. So now X "knows" that relay-W alone is operated, and if X itself is NOT operated then we obviously have a set of exactly one relay. This is a breach of the specs, so we'll insert a "-" in the X=0 column to indicate a complete blockage of information to relay-Y. This means that power will be cut off at this point!

If X IS operated, however, we now have TWO consecutively operated relays towards the required set of three. At this point in our analysis we have no code for this condition, so let's create code-2 to represent it, and insert 2 in the X=1 column. This signifies that X is passing along to Y the info 2L, meaning "the two last relays in the chain to this point are operated".

And so we proceed to 88c, where I've taken the process to completion, but we'll continue with the discussion, starting at 2L, code-2, and assume we have this info coming in to X, rather than being transmitted to Y. What do we do here? Well, if X=0, a set of two has been created, which again is a breach of specs, so we'll cut off power by inserting a "-" in this column. If X IS operated, we'll have a sequence of 3 relays to this point, so let's code this as 3, to stand for 3L, or "the last 3 relays are operated to this point", and insert 3 in the X=1 column.

This being another new code, we open up line 3L with 3 in the code-column, and analyse the reaction of X if this info were coming in on ITS input-lines. If X is not operated, we've now closed off our set of 3 relays, so let's code this as 4, to stand for 3NL, or "three relays operated, but not the LAST 3", and insert this code 4 in the X=0 column. Alternatively, we could let code 4 stand for 1S, meaning "We've got our set of 3 completed", but for now we'll stick with 3NL. If X IS operated, we've got four relays in our set (a breach of specs), so we'll insert a "-" in the X=1 column to cut off power.

As we have an unanalysed code-4 in our table, we're forced to open up row 3NL, code-4, and ask ourselves what X should do if it's UNoperated. It's obvious that it must pass on this same info to Y, namely, "a complete set of 3 somewhere back down the line", so we'll enter 4 in the X=0 column. And what if X IS operated? Why, it would be starting a second set, and as this is forbidden, we'll enter a "-" in the X=1 column to cut off power again. And here we seem to have ground to a halt, as we didn't create any new codes this time, so the main chore work has been done, and we've got all the specs incorporated into our table 88c.

But not quite all yet, as we still have to code for POWER-OUTPUT! This we do in 88d, by adding a column to the right of our table and heading it "Z", for output. This column has to be completed from the viewpoint of the output device itself - let's say a Light. Now, reading down the "Relays Operated" column, we ask ourselves "Should I switch ON for 'No relays

operated?'", and as the answer is NO, we don't insert anything in the Z-column for this row. Similarly for 1L (meaning "the relay immediately in front of me is operated") and for 2L (meaning "there are 2 relays operated immediately in front of me"). However, the info 3L ("3 relays operated immediately in front of me") or 3NL ("a set of 3 relays operated somewhere down the line") brings the response "YES, I should light up!", so we insert a 1 in column-Z for these two codes.
Let's take time out to re-read all that lot before moving on, but, in any case, I'm going to work out some more examples later on, just to be sure you've got it! But first we must see how to go about

ELIMINATING REDUNDANCIES IN ITERATIVE NETWORKS

Just as we've done with other procedures, out last step before drawing the actual circuit is to reduce the number of lines in the table by seeking out, and eliminating, any redundancies which may exist. We'll deal with this subject more fully later on, but for now, to maintain our flow of thought, we'll adopt a very simplified procedure.
First, we can divide our table into two definite sections, one which calls for an output of 0 and one which calls for 1. Redundancies due to equivalences cannot occur between sections, as the outputs also have to be equivalent, just as with sequential flow-tables. So let's start with Group 0, where we see that Line-0 (code-0) has nothing in common with the other two lines of the same group, so we move on to line-1. Be warned that "-" does NOT correspond to a phi, and must NEVER, under any circumstances, be combined with anything but another "-".
Comparing line-1 with line-2, we note that the X=0 column matches. As far as the X=1 column is concerned, these two lines WOULD be equivalent if only 2 and 3 were equivalent as well. Unfortunately, lines 2 and 3 belong to different groups, so it's impossible for them to be equivalent. Therefore, there are no equivalences in Group-0.
Now let's look at Group-1, and right away we see that line-3 is equivalent to line-4 as both X-columns match and also the output. We therefore superimpose lines 3 and 4 (see 88e), calling it line-3, and change all 4s to 3.

DRAWING THE PROTOTYPE FROM THE FINAL TABLE

It only remains now to draw the network of our prototype cell, bearing in mind that there are actually 50 such cells joined together in a chain. The translation of the table into a circuit is an easy task indeed, as all the necessary info is contained in the table, the circuit being drawn in a matter of seconds.

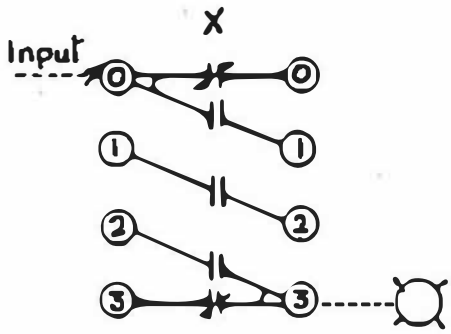


Diagram 89

First, I'll draw for you, in Diagram 89, a single cell corresponding to our prototype. There are are two vertical columns of four circles each, labelled 0, 1, 2 and 3, the left-hand column being the input-lines to our prototype, and the right-hand column the output-lines. Power-input occurs at input-line-0 of the first cell of the chain, and as our table shows that power-output occurs only in line-3, the output will therefore be taken off at output-line-3 of the final cell in the chain.
Note the heading "X" above our prototype! Still working from table 88e, we interpret all entries in the X=0 column as being NC-contacts, and those in the X=1 column as NO-contacts. Ignoring the "Relays Operated" column, we read code-0 as saying "Input-line 0 goes to", the "0" in the X=0 column as "output-line-0 via a NC-contact", and the "1" in the X=1 column as "output-line-1 via a NO-contact". The full sentence reads "Input-line-0 goes to output-line-1 via a NC and to output-line-1 via a NO", so this is what we draw at the top part of our prototype.
Code-1 reads as "Input-line-1 goes to nowhere via a NC and to output-line-2 via a NO", so we don't even draw a NC-contact from input-line-1, merely a NO-contact to output-line-2.
Similarly, input-line-2 connects to output-line-3 via a NO-contact only, and finally, input-line-3 connects to output-line-3 via a NC-contact only.

DRAWING THE COMPLETE NETWORK

It's already been mentioned that the complete circuit consists of 50 such cells connected in series, with the output-lines of one cell being the input-lines of the next. Only the first few and the last few cells in the chain will be different. For instance, looking at Diagram 90, we can see that as power comes in on input-line-0 only, input-lines 1, 2 and 3 may be omitted for the first cell. This means that cell-2 will have only input-lines 0 and 1, and so on. Similarly at the output end, output-lines 0, 1 and 2 are unnecessary in the final cell, output-lines 0 and 1 in the last but one, and so on.

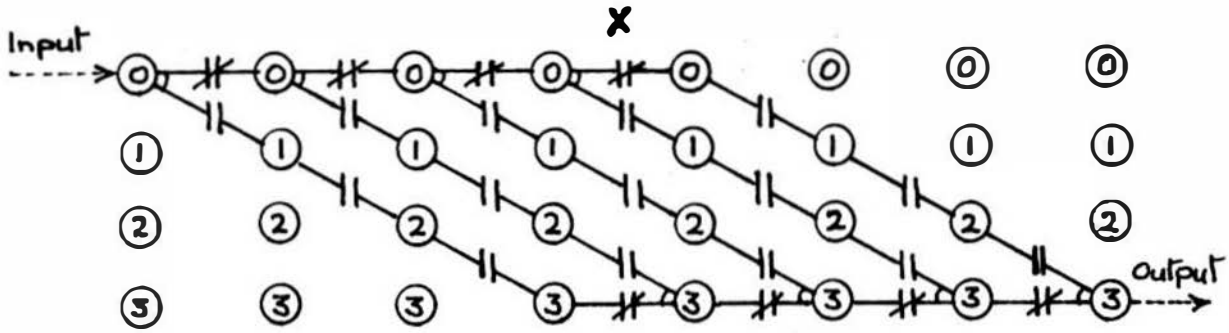


Diagram 90

Diagram 90 is a simplified version of the complete network, showing only one prototype cell X in the centre. Actually, as there are three "odd-ball" cells at either end, there'll be 44 such X-cells in the middle, all exact copies of our full prototype.

A little study of 90 shows that the operation WILL be exactly as per specs! Only if a set of 3 consecutive relays is operated will power be able to flow from the top horizontal line down to the lower, and through to the output via a string of NC-contacts. If any more relays operate, the lower line will become open-circuited and cut off the power, while if less than a set of 3 is operated power will be switched only as far as level-1 or level-2 and be unable to go any further. If no relays are operated at all, power will simply travel along the top rail and terminate in level-0 at the fourth relay from the end.

SOME CHIT-CHAT

With practice, prototype cells can be constructed with very little need for combining lines. For instance, in the example just completed, once we got to constructing the code-3 line of 88c, which signifies that we've JUST completed a set of 3 immediately in front of X, we should realise that from the circuit's viewpoint it matters little whether a fourth relay energises IMMEDIATELY FOLLOWING this set, or whether it's separated by a gap of non-operated relays. In either case, the spec "one set of 3 relays" has been exceeded. Consequently, this particular circuit needn't distinguish between 3L and 3NL, and we could simply have entered "S3" in the "Relays Operated" column (meaning "we have our set of 3"), which is what we ended up with, more or less, in 88e, after having gone through the stage of 88d.

AND SOME "TRICKY" INFO RE ITERATIVE EQUIVALENCES

Before working out some more examples for you, I simply MUST unload this stuff about equivalences! I've already explained the rule that, WITHIN A GROUP, whether Group-0 or Group-1, if two or more lines have EXACTLY the same entries in both X=0 and the X=1 columns, then they're equivalent. The higher-numbered line can thus be eliminated, and all references to this now non-existent line, wherever they occur in the remainder of the table, must be changed to that of the lower-numbered line.

In our worked-out example (see 88d again) we came to the point where we considered combining lines 1 and 2. Our thoughts went something like "1 and 2 WOULD be equivalent if "-" and "-" are (column X=0), which, of course, they are, and also (column X=1) if 2 and 3 are. So let's look at lines 2 and 3! This possibility is ruled out on three counts, (a) "-" and 4 can NEVER be compatible; (b) 3 and "-" can NEVER be compatible; and finally (c) the outputs are incompatible. And so, because we came across an incompatibility in our chain of reasoning, the original thoughts about 1 and 2 are INVALID, and they cannot be equivalent."

But suppose for a moment that line-3 not only had a 0-output, but also had the entries "-" and "1" in the X-columns. You should draw this imaginary chart and follow our new line of thought. Here we go! "The equivalence of 1 and 2 depends on the equivalence of 2 and 3, so let's look at lines 2 and 3. Aha! The two "-"s in column X=0 are equivalent, but column X=1 says that the equivalence of lines 2 and 3 depends on the equivalence of lines 3 and 1, so let's look at lines 1 and 3! But the

equivalence of lines 1 and 3 depends (in column X=1) on the equivalence of lines 2 and 3. So here we are, back at our starting-point AND NOWHERE ALONG THE WAY HAVE WE COME ACROSS A NON-EQUIVALENCE. Therefore ALL the pairs we've considered in this chain of reasoning are equivalent, namely 1 and 2, 2 and 3, and 1 and 3." That is to say, all three lines 1, 2 and 3 would be equivalent and could be rolled up into a single line-1.

In sequential flow-tables we regard different lines as being non-equivalent unless we can show them to be equivalent or pseudo-equivalent, but in prototype tables all lines within a group are regarded as being equivalent unless a chain of dependences ends with a non-equivalence somewhere. In other words, in sequential theory we must prove that two or more rows ARE equivalent, otherwise they're not, but in prototype tables we must prove that they're NOT equivalent, otherwise they are.

Some examples of simple equivalences are shown in Diagram 91, so we'll rely on this intuitive approach until we come to a more precise method for dealing with random-input sequential circuits some distance along our journey. Apart from TESTs I doubt that you'll have a REAL NEED to design an iterative network in the meantime.

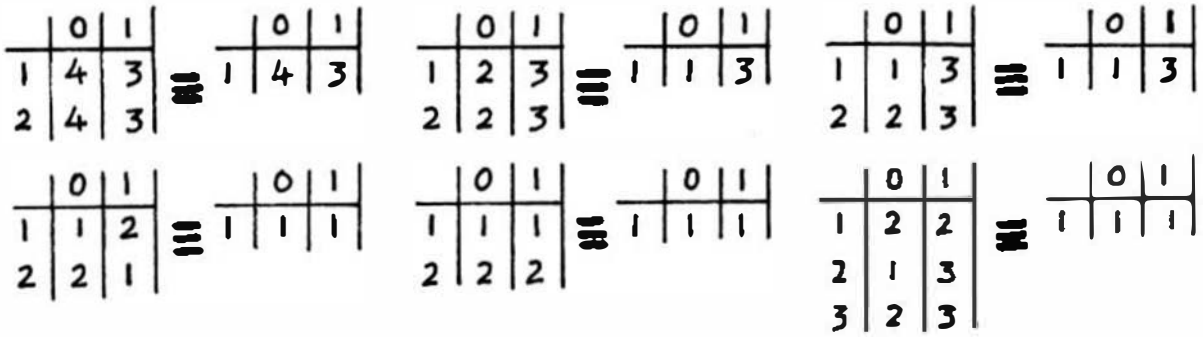


Diagram 91

The triple horizontal bars are read as "is equivalent to". Note in the final example, that although the three rows would be completely incompatible in sequential theory, our thoughts here would be "1 is equivalent to 2 if 2 is equivalent to 1 (column X=0), which it IS (as this is the possibility we're considering right now), AND if 2 is equivalent to 3 (column x=1), so let's look at lines 2 and 3. 2 and 3 are equivalent, according to column X=0, if 1 and 2 are (our original postulation) and if 3 is equivalent to 3 (column X=1). So let's look at lines 1 and 2, but, by golly, that's where we started from, and, BECAUSE WE DIDN'T COME ACROSS A NON-EQUIVALENCE ALONG THE WAY, and we've studied lines 1, 2 and 3, then these 3 lines are equivalent. So let's make them all into 1."

TO CONTINUE

And now, to familiarise you with our technique, I'll work out three more examples for you, talking my way through step-by-step. In each case, I'll set out the prototype tables in full, and then justify the entries as I go along, though as an additional exercise you should commence with a blank chart and fill in the entries as we proceed. Off we go with

ITERATIVE NETWORKS - EXAMPLE 2

Design a prototype cell for a circuit of "n" relays which will give an output iff there is exactly one set, consisting of either two or three relays.

Relays Operated	Code	X=0	X=1	Z
0	0	0	1	
1L	1	-	2	
2L	2	3	4	1
S2	3	3	-	1
3L	4	5	-	1
S3	5	5	-	1

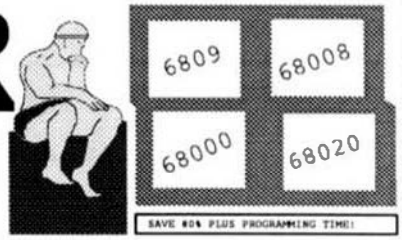
(a)

	X=0	X=1	Z
0	0	1	
1	-	2	
Note → 2	3	3	1
3	3	-	1

(b)

Diagram 92

SCULPTOR



From the world's oldest & largest OS-9 software house!

CUTS PROGRAMMING TIME UP TO 80%

6809/68000-68030 Save 70%

SCULPTOR-a 4GL - Only from S.E. Media at these prices. OS-9 levels one and two (three GIMIX) 6809, all 68XXX OS-9 standard systems. Regular SCULPTOR versions 1.4:6. One of if not the most efficient and easy to develope DBMS type systems running under OS-9! A system of flexible keyed file access that allows extremely fast record and data retrieval, insertion and deletion or other programmed modifications. Access by key or in ascending order, very fast. The system provides automatic menu generation, compilation and report generation. Practically unlimited custom input format and report formatting. A rich set of maintenance and repair utilities. An extremely efficient development environment that cuts most programming approximately 80% in development and debugging! Portable, at source level, to MS-DOS, UNIX and many other languages and systems.

Standard Version: 1.6 6809 - $1295.00
68000 $1295.00
68020 $1990.00

Due to a "Special One Time" Purchase, We Are Making This Savings Offer. Quantities Limited!

Once this supply is gone - the price goes back up!

System OS-9: 6809/68000-68030

• Regular ~~$1295.00~~

+ $7.50 S&H USA
Overseas - Shipped Air Mail Collect

ONLY **$295.00**

S.E. MEDIA
POB 849
5900 CASSANDRA SMITH ROAD
HIXSON, TN 37343 615 842-4601

$AVE - WHILE SUPPLIES LAST!

Telephone: (615) 842-4600

South East Media

OS-9, UniFLEX, FLEX, SK*DOS
SOFTWARE

Telex: 5106006630

!!! Please Specify Your Operating System and Disk Size !!!

SCULPTOR

Full OEM & Dealer Discounts Available!

THE SCULPTOR SYSTEM

Sculptor combines a powerful fourth generation language with an efficient database management system. Programmers currently using traditional languages such as Basic and Cobol will be amazed at what Sculptor does to their productivity. With Sculptor you'll find that what used to take a week can be achieved in just a few hours.

AN ESTABLISHED LEADER

Sculptor was developed by professionals who needed a software development tool with capabilities that were not available in the software market. It was launched in 1981 and since then, with feedback from an ever-increasing customer base, Sculptor has been refined and enhanced to become one of the most adaptable, fast, and above all reliable systems on the market today.

SYSTEM INDEPENDENCE

Sculptor is available on many different machines and for most operating systems, including MS DOS, Unix/Xenix and VMS. The extensive list of supported hardware ranges from small personal computers, through multi-user micros up to large minis and mainframes. Sculptor is constantly being ported to new systems.

APPLICATION PORTABILITY

Mobility of software between different environments is one of Sculptor's major advantages. You can develop applications on a stand-alone PC and – without any alterations to the programs – run them on a large multi-user system. For software writers this means that their products can reach a wider marketplace than ever before. It is this system portability, together with high-speed development, that makes Sculptor so appealing to value added resellers, hardware manufacturers and software developers of all kinds.

SPEED AND EFFICIENCY

Sculptor uses a fast and proven indexing technique which provides instant retrieval of data from even the largest of files. Sculptor's fourth generation language is compiled to a compact intermediate code which executes with impressive speed.

INTERNATIONALLY ACCEPTED

By using a simple configuration utility, Sculptor can present information in the language and format that you require. This makes it an ideal product for software development almost anywhere in the world. Australasia, the Americas and Europe – Sculptor is already at work in over 20 countries.

THE PACKAGE

With every development system you receive:

- ☐ A manual that makes sense
- ☐ A periodic newsletter
- ☐ Screen form language
- ☐ Report generator
- ☐ Menu system
- ☐ Query facility
- ☐ Set of utility programs
- ☐ Sample programs

For resale products, the run-time system is available at a nominal cost.

Facts **Features**

DATA DICTIONARY

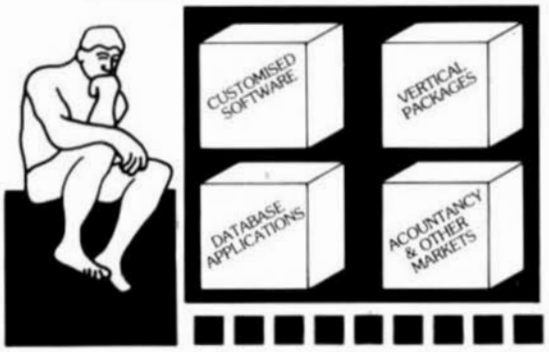
Each file may have one or more record types described. Fields may have a name, heading, type, size, format and validation list. Field type may be chosen from:

- ☐ alphanumeric
- ☐ integer
- ☐ floating point
- ☐ money
- ☐ date

DATA FILE STRUCTURE

- ☐ Packed, fixed-length records
- ☐ Money stored in lowest currency unit
- ☐ Dates stored as integer day numbers

Sculptor for 68020 OS-9 & UniFLEX $995



INDEXING TECHNIQUE

Sculptor maintains a B-tree index for each data file. Program logic allows any numbers of alternative indexes to be coded into one other file.

INPUT DATA VALIDATION

Input data may be validated at three levels:

- ☐ automatic by field type
- ☐ validation list in data dictionary
- ☐ programmer coded logic

ARITHMETIC OPERATORS

-	Unary minus
*	Multiplication
/	Division
%	Remainder
+	Addition
-	Subtraction

MAXIMA AND MINIMA

Minimum key length	1 byte
Maximum key length	160 bytes
Minimum record length	3 bytes
Maximum record length	32767 bytes
Maximum fields per record	32767
Maximum records per file	16 million
Maximum files per program	16
Maximum open files	Operating system limit

PROGRAMS

- ☐ Define record layout
- ☐ Create new indexed file
- ☐ Generate standard screen form program
- ☐ Generate standard report program
- ☐ Compile screen form program
- ☐ Compile report program
- ☐ Screen form program example
- ☐ Report program example
- ☐ Menu program

RELATIONAL OPERATORS

=	Equal to
<	Less than
>	Greater than
< =	Less than or equal to
> =	Greater than or equal to
< >	Not equal to
and	Logical and
or	Logical or
ct	Contains
bw	Begins with

SPECIAL FEATURES

- ☐ Full date arithmetic
- ☐ Echo suppression for passwords
- ☐ Terminal and printer independence
- ☐ Parameter passing to sub-programs
- ☐ User definable date format

- ☐ Query facility
- ☐ Reformat file
- ☐ Check file integrity
- ☐ Rebuild index
- ☐ Alter language and date format
- ☐ Setup terminal characteristics
- ☐ Setup printer characteristics

SCREEN-FORM LANGUAGE

- ☐ Programmer defined options and logic
- ☐ Multiple files open in one program
- ☐ Default or programmer processing of exception conditions
- ☐ Powerful verbs for input, display and file access
- ☐ Simultaneous display of multiple records
- ☐ Facility to call sub-programs and operating system commands
- ☐ Conditional statements
- ☐ Subroutines
- ☐ Independent of terminal type

MUSTANG-020 Users - Ask For Your Special Discount!

		•	••	•••		•	••	•••
MUSTANG-020	*$1,990	$398	$795	**PC/XT/AT/MSDOS**	$695	$139	$299
MUSTANG-08	*$1,295	$259	$495	**Call or write for prices on the following systems.**			

XENIX SYS III & V, MS-NET, UNIX SYS III & V, ATARI OS-9, 68K, UNOS, ULTRIX/VMS (VAX,REGAL), STRIDE, ALTOS, APRICORT, ARETE, ARM-STRONG, BLEASDALE, CHARLES RIVERS, GMX, CONVERG TECH, DEC, CIFER, EQUINOX, GOULD, HP, HONEYWELL, IBM, INTEL, MEGADATA, MOTOROLA, NCR, NIXDORF, N.STAR, OLIVETTI/AT&T, ICL, PERKINS ELMER, PHILIPS, PIXEL, PLESSEY, PLEXUS, POSITRON, PRIME, SEQUENT, SIEMENS, SWTPC, SYSTIME, TANDY, TORCH, UNISYS, ZYLOG, ETC.

*** For SPECIAL LOW SCULPTOR prices especially for 6809/68XXX OS-9 Systems - See Special Ad this issue. Remember, "When they are gone the price goes back up as above!"**

... Sculptor Will Run On Over 100 Other Types of Machines ...
... Call for Pricing ...

!!! Please Specify Your Make of Computer and Operating System !!!

- • Full Developement Package
- •• Run Time Only
- ••• C Key File Library

Availability Legends
O = OS-9, S = SK*DOS
F = FLEX, U = UniFLEX
CCO = Color Computer OS-9
CCF = Color Computer FLEX

VISA

South East Media
5900 Cassandra Smith Rd. · Hixson, Tn. 37343
Telephone: (615) 842-4600 Telex: 5106006630

mastercard

•• Shipping ••
Add 2% U.S.A. (min. $3.50)
Foreign Surface Add 5%
Foreign Airmail Add 10%
Or C.O.D. Shipping Only

*OS-9 is a Trademark of Microware and Motorola. *FLEX and UniFLEX are Trademarks of Technical Systems Consultants. *SK*DOS is a Trademark of Star-K Software Systems Corp.

ECHO echos to either screen or file.

FIND an improved *find* command with "*pattern*" matching and wildcards. Very useful.

HEX dumps files in both hex and ASCII.

INCLUDE a f le copy program that will accept " ncludes" of other disk files.

KWIC allows rotating each word, on each line to the beginning. Very useful n a sort program, etc.

LISTDIR a directory listing program. Not super, but better than CAT.

MEMSORT a high-speed text file sorter. Up to 10 fields may be sorted. Very fast. Very useful.

MULTICOL width of page, number of columns may be specified. A MUST!

PAGE similar to LIST but allows for a page header, page width and depth. Adjust for CRT screen or printer as set up by CONFIG. A very smart print driver. Allows pi nter control commands.

REMOVE a fast file delcter. Careful, no prompts issued. Zap, and its gone!

SCREEN a screen listing utility. Word wraps text to f t screen. Screen depth may be altered at run time.

SORT a super version of MEMSORT. Ascending/descending order, up to 10 keys, case over-ride, sort on nth word and sort on characters if file is small enough, sorts in RAM. If large file, sort is constrained to size of your largest disk capacity.

TPROC a small but nice text formatter. Th s is a complete formatter and has functions not found in other formatters.

TRANSLIT sorts a file by x keyfields. Checks for dupl cations. Up to 10 key f les may be used.

UNROTATE used with KWIC this program reads an input file and unfolds it a line at a time. If the file has been sorted each word will be presented in sequence.

WC a word count ut lity. Can count words, characters or lines.

NOTE: this set of utilities consists of 6 5-1/4" disks or 2 8" disks, with source (PL9). 3 5-1/4" disks or 1 8" disk without source. Complete set SPECIAL INTRO PRICE:
5-1/4" with source FLEX or SK-DOS - $129.95
without source - $79.95
8" with source - $79.95 - without source $49.95

FULL SCREEN FORMS DISPLAY from Computer Systems Consultants - - TSC Extended BASIC program supports any Sei al Terminal with Cursor Control or Memory-Mapped Video Displays; substantially extends the capabilities of the Program Designer by providing a table-driven method of describing and using Full Screen D splays.
FLEX, SK-DOS and CCF, UniFLEX - $25.00, with Source - $50.00

SOLVE from S.E. Media - OS-9 Levels I and II only. A Symbolic Object/ Logic Verification & Examine debugger. Including inline debugging, disassemble and assemble. SOLVE IS THE MOST COMPLETE DEBUGGER we have seen for the 6809 OS-9 series! SOLVE does it all! With a rich selection of monitor, assembler, disassembler, environmental, execution and other miscellaneous commands, SOLVE is the MOST POWERFUL tool-kit item you can own! Yet, SOLVE is simple to use! With complete documentation, a snap! Everyone who has ordered this package has raved! See review - 68 Micro Journal - December 1985. No 'blind' debugging here, full screen displays, rich and complete in information presented. Since rev ew in 68 Micro Journal, this is our fastest mover!
Levels I & II only - OS-9 $69.95

DISK UTILITIES

OS-9 VDisk from S.E. Media -- For Level I only. Use the Extended Memory capabil ty of your SWTPC or Gimix CPU card (or similar format DAT) for FAST Program Compiles, CMD execution, high speed inter-process communications (without pipe buffers), etc. - SAVE that System Memory. Virtual Disk size is variable in 4K increments up to 960K. Some Assembly Required.
Level I OS-9 object $79.95; with Source $149.95

O-F from S.E. Media -- Wr tten in BASIC09 (with Source), ncludes: REFORMAT, a BASIC09 Program that reformats a chosen amount of an OS-9 disk to FLEX, SK-DOS Format so it can be used normally by FLEX, SK-DOS; and FLEX, a BASIC09 Program that does the actual read or wr te function to the special O-F Transfer Disk; user-friendly menu driven. Read the FLEX, SK-DOS Directory, Delete FLEX, SK-DOS Files, Copy both direct ons, etc. FLEX, SK-DOS users use the special disk just like any other FLEX, SK-DOS disk
OS-9 - 6809/68000 $79.95

LSORT from S.E. Media - A SORT/MERGE package for OS-9 (Level I & II only). Sorts records with fixed lengths or variable lengths. Allows for either ascending or descend ng sort. Sorting can be done in either ASCII sequence or alternate collating sequence. Right, left or no justification of data fields available. LSORT includes a full set of comments and errors messages.
OS-9 $85.00

HIER from S.E. Media - *HIER is a modern hierarchal storage system for users under FLEX, SK-DOS.* It answers the needs of those who have hard disk capabilities on their systems, or many files on one disk - any size. **Using HIER a regular (any) FLEX, SK-DOS disk (8 - 5 - hard disk) can have sub directories.** By this method the problems of assigning un que names to files is less burdensome. Different files with the exact same name may be on the same disk, as long as they are in different directories. For the winchester user this becomes a must. Sub-directories are the modern day solution that all current large systems use. **Each directory looks to FLEX, SK-DOS like a regular file, except they have the extension '.DIR'.** A full set of directory handling programs are included, making the operation of HIER simple and straightforward. A special install package is included to install HIER to your particular version of FLEX, SK-DOS. Some assembly required. Install indicates each byte or reference change needed. Typically - 6 byte changes in source (furnished) and one assembly of HIER is all that is required. No programming required!
FLEX - SK-DOS $79.95

COPYMULT from S.E. Media -- Copy LARGE Disks to several smaller disks. FLEX, SK-DOS utilities allow the backup of ANY size disk to any SMALLER size diskettes (Hard Disk to floppies, 8" to 5", etc.) by simply inserting diskettes as requested by COPYMULT. No fooling with directory deletions, etc. COPYMULT.CMD understands normal "copy" syntax and keeps up with files copied by maintaining directories for both host and receiving disk system. Also includes BACKUP.CMD to download any size "random" type file; RESTORE.CMD to restructure copied "random" files for copying, or recopying back to the host system; and FREELINK.CMD as a "bonus" utility that "relinks" the free chain of floppy or hard disk, eliminating fragmentation.
Completely documented Assembly Language Source files included. ALL 4 Programs (FLEX, SK-DOS, 8" or 5") $99.50

First, we draw up a blank table, with all headers, including Z, and start off with 0 in both the "Relays Operated" and "Code" columns. We'll study X's reaction to the info "No relays operated so far". If X=0 there are still no relays operated, so we'll pass on Code-0 to Y, but if X=1 we record 1 to signify 1L ("One relay operated so far").
The creation of code-1 forces us to open up line-1, where, if X=0, a set of 1 is formed, and as this is a breach of specs we'll cut off power with a "-". But if X=1, we have a sequence of 2 so far, so we'll record 2 to signify 2L.
Now we have a code-2 to analyse! If X=0 a complete set of 2 has been formed, so we'll enter a 3 to signify S2 (a set of 2), but if X=1 we now have 3 in sequence, so we'll enter 4 to signify 3L. Note that we now have TWO undefined codes, namely 3 and 4, so we open up lines 3 and 4! Let's do code-3 first.
If X=0, the code S2 still applies and we enter a 3 in this column, but if X=1 we'll be starting a second set (forbidden), so we cut off power. Then to line-4.
In this line, if X=0 we've completed a set of three, which we'll indicate with code-5 to stand for S3 (a set of 3), as this is a new situation, but if X=1 we've "gone over the top" with 4 relays, so we cut off power with a "-". This line forces us to open up line-5, where, if X=0, the situation is still S3, so we enter a 5 in this column, but if X=1 then, obviously, a second set is under way, so once more we'll cut off power.
No new code-numbers means we've come to the end of our design, so let's switch our viewpoint to that of the output, by checking Z against the "Relays Operated" column. Zero relays or one relay immediately before Z certainly don't call for an output, but either 2 relays immediately in front or a set of 2 "down the line somewhere" indicate a need for a "1" in the Z-column, as does 3 relays immediately in front, or a set of 3 down the line.
Equivalences, here we come!! There are only two lines in Group-0, but the "-" in line-1 right away makes them incompatible. So let's study Group-1. Line-2 is incompatible because a 4 CANNOT be combined with a "-". Lines 4 and 5 are certainly compatible, but how about line-3? Let's compare it with line-4, and say "Lines 3 and 4 would match if only 3 and 5 were compatible. Now let's compare 3 and 5! Lines 3 and 5 would match if only 3 and 5 were compatible. (see column X=0 in all cases). We can't go any further, and as we haven't come across an INCOMPATIBILITY, then all three are equivalent, so we'll roll up 3, 4 and 5 into a new line-3, and make all 4s and 5s into 3. We could alternatively have gone the route of rolling-up line-5 into Line-4, as they're definitely equivalent, and making all 5s into 4, then checking lines 3 and 4 by saying "Lines 3 and 4 would match if only 3 and 4 were equivalent. End of run, no incompatibilities, therefore they are so!"

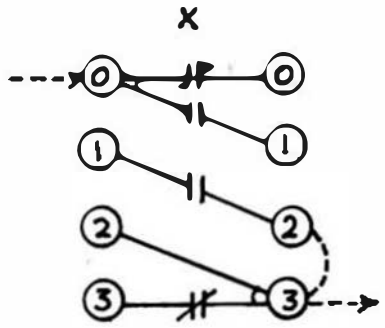


Diagram 93

Either way, we end up with Diagram 92b, where you'll notice I've drawn your attention to Line-2. This is a special case, because both columns of X contain the same 3-entry, and in terms of relay contacts means that input-line-2 is connected to output-line-3 through both a NC and a NO-contact. In other words, whether X is operated or not, input-line-2 will be connected to output-line-3, and we can save ourselves these two contacts by making a direct connection instead, as I've shown in the prototype of Diagram 93.

NEW PROTOTYPING RULE

And so we have a new rule for prototyping

If the same code occurs in both columns X=0 and X=1 in any one line, a direct connection will be made between the input and output lines concerned.

Note that power is taken off at both output-lines 2 AND 3 as column-Z has a 1-entry in BOTH these lines. Are you beginning to get the hang of it now? Let's do another example to give you a better picture.

ITERATIVE NETWORKS - EXAMPLE 3

Design a prototype cell for a circuit of "n" relays which will give an output iff there is exactly one set, which MUST contain an odd number of relays.

That's certainly different from what we've encountered so far, but as we thrive on variety let's begin with all column headings marked out, and the codings for line-0 inserted, as shown in Diagram 94a. So ... if code-0 comes into X and X=0 the same code goes out, but if X=1 we'll send out code-1 to indicate "Odd/L" (meaning "an odd number immediately in front of you").

Relays Operated	Code	X 0	X 1	Z
0	0	0	1	
Odd/L	1	2	3	1
S/Odd	2	2	-	1
Even/L	3	-	1	

(a)

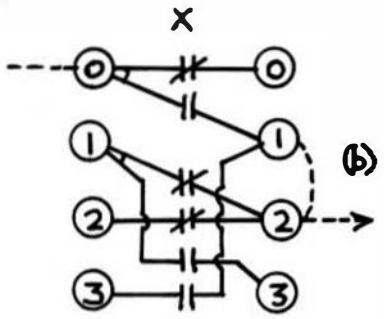


Diagram 94

In line-1, if X=0, we have our odd set, which we'll identify with code-2 and S/odd. If X=1 we have an even set SO FAR, which we'll code as 3 and Even/L. This, of course, means opening up two new lines, 2 and 3.
Considering line-2, if X=0 the state of affairs remains unchanged at S/odd, but if X=1 we're starting a second set, so let's cut off the power. And in line-3, with an even-numbered string of relays so far, if X=0 we've formed an even SET, so we'll cut off power here too. But, if X=1, we're back to an odd-numbered string so far, so we'll go back to line-1! Agreed?
Finally, looking at things from Z's viewpoint, we'll insert 1s in both lines 1 and 2. There are no equivalences (we must be getting better at this sort of thing!), so we draw the prototype cell of Diagram 94b directly from 94a. The input power comes in at Line-0, and is taken off at output lines 1 and 2 of the final cell, just as it came off at lines 2 and 3 in Example-2.
One more example to wrap this whole thing up.

ITERATIVE NETWORKS - EXAMPLE 4

Design a prototype cell for a network of "n" relays which will give an output if there are EXACTLY two sets of any size whatsoever.

This looks interesting, so let's go for it! But first note that we're concerned with the number of SETS this time, not the number of RELAYS, so we head our info-column in Diagram 95a with "Sets Operated". Commencing on Line-0, if X=0 the same code goes out, and if X=1 we have the start of Set-1, which we'll call code-1. In line-1, if X=0 we've completed this set, so we'll use code 2 for 1S ("one set completed"), but if X=1 we're still working on our first set, so we insert code-1 here.
Now for line-2! If X=0 we still have one set down the line (code-2), but if X=1 we're now starting on our second set. Let's code this as 3 and "1S + 1L", meaning, of course, "one set complete, plus a second starting immediately in front of you".
Moving to Line-3, if X=0 we've formed our two sets, which we code as 4, and 2S, whose meaning is quite clear. However, if X=1 we're merely enlarging the size of this second set so we'll stick with code-3. We still have to analyse line-4, where, if X=0, the situation is unchanged at code-4, but if X=1 we're beginning work on a third set (forbidden), so we cut off power. And here the table naturally grinds to a halt.
The output-Z is only interested in two complete sets, so we'll insert 1s in lines 3 and 4. Again there are no equivalences, so the prototype cell shown in Diagram 95b can be drawn directly from 95a.

This concludes the NORMAL technique for constructing iterative networks, though next time we'll take a quick look at a more advanced method (not too often used) which MAY reduce the number of contacts in a prototype cell, but certainly shouldn't increase them. So now you can all try your hand at TEST FOURTEEN-A coming up! FOURTEEN-B will unfold next time.

TEST FOURTEEN-A

Design the prototype cell for a circuit of "n" relays which will give an output

(a) iff there is only ONE set, consisting of either ONE or THREE relays.
(b) iff ALL sets consist of ONE or THREE relays, and there's at least one set.
(c) iff ALL sets consist of ONE or THREE relays, OR if no relays are operated.
(d) iff there is EXACTLY one set, containing at least TWO relays.
(e) iff there are exactly TWO sets, containing exactly TWO relays each.

The following are NOT COMPULSORY .... but why not try them?

(f) iff there are exactly TWO sets, one with ONE relay and the other with TWO.
(g) iff there is exactly ONE set of THREE relays, but there may be other sets of any other size.
(h) iff there is exactly ONE set of two UNOPERATED relays! Watch this one!!
(i) if there are any number of sets of any size, EXCEPT that output must be cut off iff there is among them exactly ONE set of ONE or TWO relays.
HINT : Design for a circuit which WILL give an output for one set of either one or two relays, and then graphically complement it.
(j) iff there are exactly TWO sets, one of TWO relays and the other of any other size.

Hope you enjoy these! Just to ease your load, I'll set up camp and cook a meal while you folks get scribbling on your pads!

... End of Mile 17, sitting at marker "Mile 18"

+++

FORTH

A Tutorial Series

By: R. D. Lurie
9 Linda Street
Leominister, MA 01453

FORTH09: A FORTH for OS-9 on the 6809

Here it is at last! Dan Johnson has come through for us just like the proverbial cavalry at the end of a John Wayne movie. He has written a completely full-featured FORTH-83 for OS-9. I hope that you will pardon me while I drool as I type this, since I am most excited with Dan's opus.

This product is called "FORTH09", and it has absolutely no relationship to the public domain minimal program of the same name which I discussed in my August, 1988, column.

General Description

FORTH09 is a greatly expanded 83-FORTH. It meets all of the requirements of the standard, plus it has a number of its own expanded features. In fact, FORTH09 has so many features that I cannot possibly do all of them justice in a short review. As one should expect from a quality product, FORTH09 includes an assembler and a screen editor.

The assembler covers all of the 6809 addressing modes, and, of course, it uses RPN, so beginners will think that the statements look a little confusing. However, it takes practically no time to become used to that. The relative branches are handled in a high-level format. This way, the programmer does not have to worry about whether a branch is short or long. The manual contains an entirely adequate explanation of how this works.

The screen editor comes configured for 3 standard terminals and for the CoCo3. Just choose the type that you are using and compile the proper screens. If your terminal doesn't fit one of the current choices, you can find instructions on making the changes to one of the existing forms or on writing your own.

There is a kernal of code which must be loaded at startup, but the rest of the code is in screens which can be compiled as needed. Therefore, one can tailor a version of FORTH09 to a specific job without carrying a lot of excess code which does nothing but occupy RAM or ROM. The manual says that by choosing to do so, efficient ROM code can be generated (I have no way to burn a ROM, so I can't check this, but I don't doubt it!)

The important OS-9 calls are available directly from FORTH09, so this would eliminate a lot of the need for assembly language routines. In fact, I am such a klutz with OS-9 that I was amazed when I could use the calls so easily. Certainly, I had a lot less trouble than I had with C or BASIC09! Furthermore, I hope to use FORTH09 to teach myself more about how OS-9 operates. Talk about "instant gratification"!!!

Scope

FORTH09 is the epitome of wide usefullness. The same version works on both Level I and Level II OS-9. The only reason I can think of for having two working copies of the system disk is that you do need a different boot for Level I and Level II. Otherwise, it would be difficult to know which version you were using. As I see it now, I think that FORTH09/Level I would be most useful for machine control and FORTH09/Level II would be best every where else.

As I mentioned before, FORTH09 has been designed to work well on virtually any 6809 machine running OS-9. I only have OS-9 for the CoCo, so I can't check this for sure, but it looks fine to me from reading the manual and the screens. Other than disk format, the only differences that I anticipate would arise from the peculiarities of a particular terminal configuration.

I will confess that after I received my review copy of FORTH09, I finally realized just how much I HATED OS-9! Well, that has suddenly changed. I can't say that OS-9 is my favorite operating system, yet, but FORTH09 has certainly turned the corner for me.

Detailed Description

FORTH09 differs from the usual FIG model in several important ways. First of all, this is a subroutine-threaded code, rather than the string of execution addresses which are indirectly loaded and executed by NEXT. Whenever speed is important, the compiler can be signaled to compile a definition in line, rather than as a subroutine jump. This is not routinely done, because it can make a significant difference in the length of the code, but it is a dynamically available option.

Two separate dictionaries are maintained by FORTH09. They are called the PRIMARY and the SECONDARY dictionary. The significance is that it is possible to SAVE only the PRIMARY dictionary, thus creating a minimum sized block of code which can stand alone, as in ROM. However, the SAVESYS command saves both dictionaries, which is important since the assembler and editor are entirely in the SECONDARY dictionary. Following Dan's recommendation, I normally select the SECONDARY dictionary for all of the definitions which I write and then do a SAVESYS ; after all, disks are cheap!

Each dictionary header is separate from its code. I don't know what difference that would make to the average user, but it would make it virtually impossible for somebody to reverse-engineer a ROM made with FORTH09.

Dan has provided a large number of additional definitions beyond 83-FORTH. This includes a pretty complete line of double-number words, so there would probably be no need for a floating-point package; 32-bit numbers generally exceed the capacity of most floating-point packages, and scaling should be used for the big number/little number problem, anyway.

Dan has exerted a little bit of author's license in changing some of the familiar FORTH words to fit in with his ideas. As examples, he has DDUP instead of 2DUP and ENDIF instead of THEN as his preferred forms. However, he has provided the common synonyms, also, so this does not present a problem. In fact, he has provided the word EQU which generates a synonym for any existing word, so you can customize you own package, if you want to. All of these changes are adequately covered in the glossary and will never cause you a problem, unless you are working with the minimum possible memory.

Caveats

A couple of points should be made about the differences between FORTH09 and some other FORTHs, which might otherwise fall between the cracks. All of the problems mentioned here are related to transportability of programs and data between various FORTHs. If you are not concerned about that, then you can skip the next few paragraphs.

Decimal point within a number: It is usually acceptable to enter a number containing a decimal point, even though that decimal point will be ignored during integer math operations. However, the location of the decimal point is saved in a variable, usually called DPL , for use in some later operations. I have not been able to make FORTH09 accept a number containing a decimal, no matter how I have tried. Furthermore, DPL is not provided, so you will have to use your own. As I write this, I don't know how to "fix" it, but I will ask Dan to look into the matter. He has said that he intends to release a floating-point package, which should eliminate the whole problem, but it can interact unfavorably with existing programs which use math operations.

Flagging double numbers: All other FORTHs flag the keyboard input of a double number by terminating the entry with a ".", but FORTH09 does this by preceeding the first digit with a "#". I can't see that this would affect the portability of FORTH code, since the only change is during keyboard entry, and not during program execution. The only problem might come from reading data from a text file on disk, but even that appears to be a little far-fetched. All in all, I think that the only real problem could come from the frustration of having to learn another way to enter keyboard data, but even I learned, so you can, too.

```
Screen #1
\ Test samples                                  \ RDL092188 |0
                                                            |1
SECONDARY                                                   |2
                                                            |3
: EX0   ( - )                                               |4
   CR  ." This is the first example."  CR ;                 |5
                                                            |6
: EX1   ( - )                                               |7
   CR  ." This is the second example."  CR ;                |8
                                                            |9
: EX2   ( - )                                               |10
   CR  ." This is the third example."  CR ;                 |11
                                                            |12
: EX3   ( - )                                               |13
   CR  ." This is the fourth example."  CR ;                |14
                                                            |15
```

```
Screen #2
\ The first experiment                                    RDL092188 |0
                                                                    |1
: TABLE1                                                            |2
    CREATE                                                          |3
    DOES>    SWAP  2*  +  @  EXECUTE ;                             |4
                                                                    |5
TABLE1   EXPERIMENT1            \ create the vector table           |6
    ]  EX0  EX1  EX2  EX3  [    \ load the table                    |7
```

Vector table generation: There are two common ways to generate vector jump tables; one way is shown in Screen #2 and the other in Screen #3. At this point, I simply want to say that the method shown in Screen #2 will crash in FORTH09, but the method is Screen #3 works fine. This appears to be a function of the way FORTH09 is built, and is not something that can be changed. On the other hand, I think that the method shown in Screen #2 is very poor programming practice and should be killed, any way. However, many programs exist which use the scheme of Screen #2, so watch out for it!

Shadow screens: FORTH09 requires that you use shadow screens. Unless you can think of some trick to play on the system, these screens are only useful for documenting the corresponding "regular" screen. There is no real harm, here, except that I don't like to be forced into an unfamiliar documentation scheme. I much prefer to document directly on the program screen so that I can see the comment and the code at the same time. This is only possible with shadow screens when you have a 132-column display. Also, I admit to a rather silly prejudice against "wasting" so much disk space.

SOURCE: D. P. Johnson, 7655 Southwest Cedarcrest St., Portland, OR 97223. $150 (plus $3 S/H).

VECTORED JUMP TABLES

In my last column, I discussed forward addressing and showed a rather elegant way to generate a vectored jump table. I would now like to discuss another way which used the CREATE ... DOES> construct; it is not as elegant, but is much simpler to type. However, it will not do the job of cross-selecting menus which was discussed last time; try it and you will see why.

Screen #1 simply defines the four words to be selected by our jump table. These definitions must be written before the table is defined, but can be written after the defining words TABLE1 and TABLE2 . I have placed them in the first screen simply for convenience in illustrating the point.

Screen #2 uses CREATE ... DOES> to define a "defining word" called TABLE1 . Notice that CREATE simply leaves an open space to be filled by the vectors at a later date. No specific amount of space is reserved at this time, so we have not specified how large the table is to be. The DOES> specifies what is to be done at run-time with the data in the table, but not how the data are to get there.

Line #6 of Screen #2 actually creates the vector table. Notice that this line is actually a command line which is executed when the screen is first loaded, and it is not a part of a definition to be executed later. The format of the command is simply its name TABLE1 , which invokes its name, and EXPERIMENT1 , which is the name of the jump table. Nothing could be simpler, which probably accounts for the popularity of this format.

All that is necessary to load the table named EXPERIMENT1 is the command shown in line #7. This must immediately follow the table invocation, or the scheme won't work. This line works because] immediately turns on the compiler and loads into the dictionary the execution addresses of the following words. The [immediately switches back to the interpretor, thereby stopping the addition of execution addresses to the dictionary.

Screen #3 starts off pretty much the same way, but CREATE takes a number from the Data Stack and allocates the actual storage space for the table during compilation. This way, the size of the table is set explicitly and is fixed as soon as TABLE2 is invoked. Therefore, it is not necessary to fill the table immediately, but it can be done at any time. This is a great programming convenience.

The action of DOES> in this screen is exactly the same as in Screen #2. You can see this with a Data Stack diagram, which you should construct if you need more help understanding the following explanation. The definition is entered with the address of the first element of the table as the top of the stack and the offset into the table as the next element of the stack. Therefore, the SWAP is necessary to get the offset into the right place. 2* multiplies the offset by the 2 bytes taken by a 16-bit address and + adds the result to the starting address. @ calls the execution address and EXECUTE jumps to it.

```
Screen #3

\ The second experiment                                    RDL092188 |0
                                                                     |1
: TABLE2                                                             |2
    CREATE   2*  ALLOT                                               |3
    DOES>    SWAP  2*  +  @  EXECUTE ;                               |4
                                                                     |5
4 TABLE2   EXPERIMENT2              \ create the vector table        |6
                                                                     |7
'  EX0  '  EXPERIMENT2  >BODY  0  2*  +  !  \ load the table        |8
'  EX1  '  EXPERIMENT2  >BODY  1  2*  +  !                          |9
'  EX2  '  EXPERIMENT2  >BODY  2  2*  +  !                          |10
'  EX3  '  EXPERIMENT2  >BODY  3  2*  +  !                          |11
```

The vector table is created by the command in line #6. The first command must be a number which sets the size of the table, 4 in this case. This means that there will be 4 addresses stored in a table named EXPERIMENT2 . Again, this is pretty much the same as in Screen #2, with the exception of the size of the table being on the Data Stack before calling TABLE2 .

The remainder of Screen #3 simply shows one way to fill the vectored jump table named EXPERIMENT2 . Notice that I have used an expanded format for each of the four commands required to load the four execution addresses into the table called EXPERIMENT2 . This makes the commands self-documenting, which is a big help. It shows which address goes where in the table. It also makes it easy to change the table later, but this smacks too much of self-modifying code to be to my taste. It is much more difficult to modify TABLE1 , because it is harder to find which address went where (this may be an advantage!?!).

Either scheme, Screen #2 or Screen #3, will work with most versions of FORTH, but not with FORTH09. You can only use the procedure in Screen #3 with FORTH09. However, the algorithm implemented in Screen #3 is better for several reasons, so I recommend it, no matter which FORTH you are using.

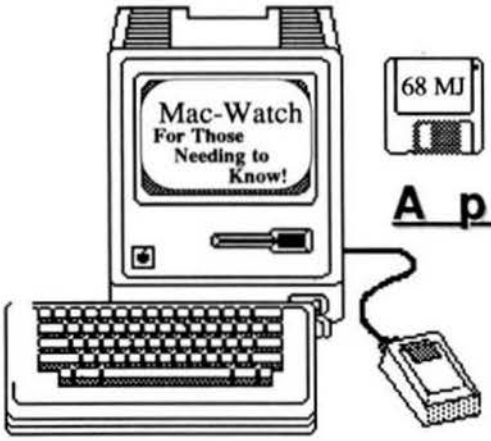
CORRECTION

A line got left out of the definition of DO-IT in the last column. The first line of the definition should be

R> DROP

followed by the rest of the definition. Without this addition, the Return Stack will eventually overflow. I did not catch the error simply because I did not cycle through the example enough times. Dave Angel caught this for me when I showed him the code. This just proves that, no matter how hard I try and how hard I test, I cannot guarantee that my code will always be perfect!?!

+++



The Macintosh™ Section

Reserved as

A place for your thoughts

And ours.....

Mac-Watch

A Review of ThePerfectWORD™

Software for Bible Study and Research

By James E. Law
1806 Rock Bluff Rd.
Huson TN 37343

If I said that the Macintosh can be all things to all people, you would no doubt think the case to be somewhat overstated. Even Apple's Mac evangelists wouldn't go quite that far. It is true, however, that the Macintosh (and other computers) can serve an almost unbelievably wide variety of needs from spreadsheets for *Accountants* to data bases for a *Zinc* mining company. It should be no surprise then, to note that software is now available to support the serious Bible student and researcher.

Many people believe that the Bible is the inspired word of God, and that it tells men how to live in order to be saved. That makes it worthy of careful study. Fully understanding its message, however, takes considerable diligence and calls for the use of every tool at one's disposal. The apostle Peter said that Paul wrote "some things hard to be understood." Most Bible students won't have any difficulty in agreeing that the Bible is a challenging book.

Star Software, Inc. (229 Live Oaks Blvd. Casselberry, Florida 32707) has developed several software packages to assist students and researchers in studying the Bible. One of these, ThePerfectWORD, is a fast and powerful search engine for finding, displaying, saving, and printing verses meeting specific search criteria. I have used this program frequently over the last two months and in this review, I'll share my experiences with you.

Getting Started

When ThePerfectWORD is opened, a display window and an entry window appear. You enter search criteria in the entry window and the verses identified in the search will be shown in the display window. The entrywindow can be hidden when not in use to provide more room for text. The text can be displayed in 9, 10, or 12 point type, and the spacing between verses can be adjusted.

Show Me the Verse

One of the simpler uses of ThePerfectWORD is to view selections of text. Select the "Show" mode, enter "James 2:24," and instantly this verse appears on the screen. This portion of the program is extremely flexible and allows precise selection of just the text you want to see. For example, you might want to see Romans 4:1-25; Hebrews 11:1; 11:8-19; and James 2:14-26 at the same time. No problem. Just enter the desired verses in an easy to understand format and they all appear. Considerable abbreviating of book names is allowed. The window has standard zoom button, scroll bars, and a grow box to view text when the selection is more than can be seen at one time.

Where Does it Say. . .?

By far the most important capability of ThePerfectWORD is its ability to find verses which satisfy prescribed search criteria. The feature is perfect when you want to know where the verse is that says that Jesus is a "propitiation" (just enter the word "propitiation" in the entry window.) A more common use might be to view all the passages that mention a specific word (e.g., "marriage"). You are not limited to searching on words, but can also search on phrases (e.g., "in Christ").

ThePerfectWORD searches are FAST! For example, a search of the entire Bible for the word "covering" resulted in 43 verses being found in about 6 seconds. A search of the entire Bible for

verses that contain both the word "faith" and the word "grace" took on the order of 3 seconds. The time required for the search seems more related to the number of "hits" than the scope of material being searched. Several months ago, I reviewed a competing Bible study program, and at the time was favorably impressed with its speed. Little did I know! It quickly became apparent that ThePerfectWORD was an order of magnitude faster than its most advertised competitor.

ThePerfectWORD allows you to set the limits of your search. You may enter specific starting and stopping points. A quicker method for setting search limits is to check *Quick Set* dialog boxes such as Old Testament, Poetry, Entire Bible, Gospels, or Epistles. There is a block for almost all searches that I make, so detailed entries were rarely needed.

The PerfectWORD provides great flexibility in specifying search criteria. A string of different words or phrases may be entered and connected with symbols for "or" , "and", or "not." For example, by entering "faith, grace" you will be shown all verses which contain both the word "faith" and the word "grace." Similarly, the entry of "Adam,-Eve" will display all verses which mention "Adam" but do *not* mention "Eve." Parentheses may be used for nesting in more complex searches. This provides great power to the researcher in indicating the subjects to be identified in the search. Searches involving complex logical strings are, of course, much slower than simple word searches.Note that the logic statements are not necessarily limited to words within a given verse. For example, if the same sentence used both the terms "grace" and "faith" yet the words fell in adjacent verses, these verses could still be identified in the search example cited above. ThePerfectWORD allows the context range for input logic statements to be specified. For example, the user can say, "I want to see the places where "grace" and "faith" are mentioned within 3 verses of each other (or 1 verse, or 2 verses, etc.).

The result of searches may be displayed in two formats. Either the references only may be entered (i.e., the book, chapter, and verse) or the references with text may be displayed. An serious limitation of ThePerfectWord Revision 1.0 was that only 100 verses with text could be viewed. Fortunately, this limitation was removed in Revision 2.0 by allowing the full text of searches to be displayed regardless of the number of verses involved.

Let's See it in Context

Often, it will be useful to see the verses satisfying your search criteria in context, that is, with some preceding and following verses displayed. With other Bible search programs, you will have to pull out your Bible and look each verse up. Not so with ThePerfectWORD. Simply double click any verse and it is instantly displayed within a separate window in context. You can have ThePerfectWORD display from 1 to 10 verses before and after the verse of interest. This is a most useful feature since the division of the Bible into verses often causes breaks in the middle of sentences and ongoing thoughts.

Word Counts

Have you ever wondered how many times a particular word is used in the Bible? If so, your curiosity can be satisfied. In seconds, ThePerfectWORD can count all the occurrences of a word in the designated range. For example "Jesus" is used 983 times in the Bible, and Paul uses the word "law" 78 times in Romans. ThePerfectWORD can search for all words except about 50 very common words like "and", "the", and "a."

You can count a string of words at the same time. Enter each word you want counted separated by a space, comma, or semicolon, and the word count for each will be displayed.

ThePerfectWORD can even count words based on entry of an abbreviation. For example, if you wanted to count all forms of the word "belief", you could enter "belie." and the words "believe, believes, belief, believeth, believest, believing, and believed" would be counted and the totals for each displayed. The ability to use abbreviations to widen a count is also useful in accurately scoping out a search for verses meeting the search criteria. In the above example, a search for "belie." would result in verses containing any of the above words being displayed.

Side by Side Comparisons

One of the most impressive ThePerfectWORD features is its ability to open numerous windows at once. For example, you can display Joel 2 in one window, open a new window for Daniel 2, and then display Acts 2 to see passages on prophecy and prophecy fulfilled. Similarly, you could display at the same time, passages from each of the four Gospels dealing with a particular parable. You can do the same thing with the results of word searches. For example, in one window you could display all passages from Romans with the word "faith" and in another window all passages mentioning "works."

Window management is easy. The *Windows* menu lists all currently open windows and allows

you to activate any of them. If you select *Tile Windows* from the *Display* menu, all text windows are neatly arranged side by side. With this feature you can easily view up to 5 windows at once. If you select "stack windows," the windows are placed in a staggered fashion behind one another so that while only one window is fully exposed, the titles of all windows are displayed. Regardless of the option chosen, any window clicked becomes active and may be scrolled to see more text.

Saving Your Work

It's likely that often you will want to save the results of your research. ThePerfectWORD provides several possibilities. First, you may export the contents of windows through the clipboard. Second, you may save any window as a text file which can be read by your word processor or page layout program. Finally, you may create a verse file.

The verse file option saves the results of your research as a list of verses without the accompanying text. This makes such files extremely compact. When you open such a file, you will have the option of viewing only the references (i.e., the book, chapter, and verse) or also see the text. The *Open*, *New*, *Save*, and *Save As* commands work with Verse Files just like other files.

Using the appropriate menu selections, you can add or delete verses to a verse file and can combine multiple verse files together. You can select the *Sort and Merge* option to remove duplicate verses and put the remaining ones in Bible order. You may also add a descriptive header to each verse file. This description will be saved, displayed, and printed with the verse file.

Printing Options

ThePerfectWORD window may be printed by selecting Print from the File menu. You may choose font size (9, 10, or 12) and verse spacing, but may not specify font style. If you want to alter the format significantly, you will need to transfer the information via a text file or the clipboard to some other application.

General Information

ThePerfectWORD can be used with the Macintosh 512E, Plus, SE, and II. Supposedly, you can operate with only one disk drive if you have at least a megabyte of RAM, but I suspect you would need the patience of Job to do so. Any program whose files occupy 2.6 megabytes calls for a hard disk for efficient operations

ThePerfectWORD is such a simple program that you will rarely need to refer to the manual. When you do, you will generally find it to be adequate. I did have some problems understanding how to use the verse file feature, but in retrospect, this was probably a result of my failure to read carefully enough and not that the manual was unclear.

Other Related Products

The text modules used in this review were the King James Version and the New International Version. Each English language translation is $75. Star Software also offers a Greek translation for $150 and a Hebrew translation for $180 translations. These enable Bible researchers to perform searches on the original Greek or Hebrew word.. The Hebrew version is entered and displayed from right to left on the screen since this language is read and written in this manner. These nonEnglish translations were examined only briefly during this review since my only language is Southern English. These products appeared to perform as advertised.

Do You Need ThePerfectWord?

I have used ThePerfectWORD frequently over the last two months and find it to be an exceptional program. Serious Bible students or researchers with access to a Macintosh cannot afford to be without this program. It does its thing so well that concordance books are made hopelessly obsolete. The speed of ThePerfectWORD is truly awesome. I had a number of concerns about limitations in Revision 1 of ThePerfectWORD but Star Software corrected all of them in Revision 2 leaving me little to gripe about. Users of Revision 1 should contact Star Software about upgrading to the new version since it is so much improved.

As a Macintosh software reviewer, I have access to a fairly wide variety of software. Most of it, however, gathers dust after the review. I can assure you that such will not be the case with ThePerfectWORD.

ThePerfectWORD is a quality product which deserves your attention. I recommend it. *EOF*

Intelligent Write / Erase Cycle Stress of MC68HC11 EEPROM Devices

Robert J. Pinteric
Motorola, Inc.
6501 WM Cannon Drive West - OE312
Austin, TX 78735
(512) 440-2077

Devices with EEPROM memories are tested in several different ways to screen units which would fail prematurely in an end-user's system. These tests typically include functional, pattern, data retention, and write / erase (W/E) cycling endurance testing. The former of these tests can be performed in a relatively short period of time using a high speed MOS test system, resulting in a low test cost per unit. However, the repeated W/E cycle stress of an EEPROM device takes a significant amount of time to complete. Screening units in this fashion using a high speed test system would result in high test costs per unit and low test throughput.

In order to minimize test costs and increase test throughput of Motorola MC68HC11 EEPROM Microcontroller units (MCU), a system has been developed which can simultaneously perform W/E cycling on up to 50 devices. These systems utilize the on-chip subsystems of the MC68HC11 in a unique way which enables each device to literally test itself. The system software enables W/E cycling of five different MC68HC11 MCU devices: MC68HC11A8, MC68HC811A2, MC68HC811E2, MC68HC11E9, and the MC68HC11F1. Although these systems are primarily used to perform production W/E cycling, it is also used to perform engineering evaluations. Furthermore, the system can be software configured to function as an MC68HC11 EEPROM gang programmer.

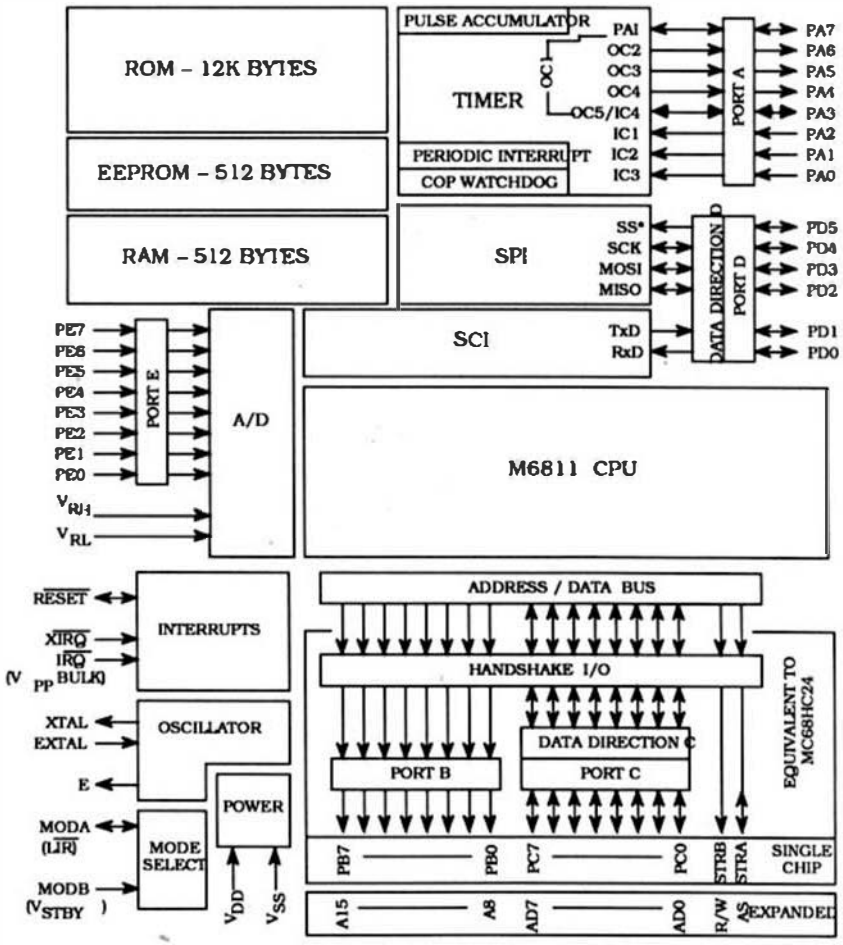


FIGURE 1 MC68HC11E9FN BLOCK DIAGRAM

DEVICE NUMBER	ROM	RAM	EEPROM	COMMENTS
MC68HC11A8	8K	256	512	ORIGINAL 68HC11
MC68HC11E9		12K	512	MORE ROM & RAM
MC68HC811A2	NONE	256	2K	NO ROM
MC68HC811E2	NONE	256	2K	4 INPUT CAPTURES
MC68HC11F1		NONE	1K	512 NON-MUX BUS

TABLE 1 MC68HC11 FAMILY OF DEVICES.

MC68HC11 Overview

In order to fully comprehend the function of the W/E cycle system, a brief overview of the MC68HC11 is necessary. As mentioned previously, there are five different members of the M68HC11 Family, each with different memory sizes and features, as listed in Table 1. For simplicity, the MC68HC11E9 MCU will be discussed. The MC68HC11E9 MCU, shown in Figure 1, contains 12k bytes of mask programmable ROM, 512 bytes of RAM, and 512 bytes of EEPROM. In addition to memory, the MC68HC11 contains an 8 bit 8 channel A/D converter, two serial ports, a 16 bit free running timer with 3/4 input capture lines and 5/4 output compare lines, a real time interrupt, and a pulse accumulator. The MCU utilizes an enhanced M6801 instruction set with 88 additional opcodes, including divide and bit manipulation instructions.

The EEPROM memory is enabled when the EEON bit in the CONFIG register is set. The write (or programming) mechanism for the EEPROM is controlled by user programmable bits in the PPROG register. The erased state of the EEPROM is $FF, thus programming changes a bit from a 1 to a 0. Programming and erasure of the EEPROM relies on an internal high-voltage charge pump.

MC68HC11 devices operate in one of four modes: 1) single-chip, where the device acts as a monolithic MCU, 2) expanded multiplexed, where two I/O ports become a multiplexed address/data bus, 3) special test, for factory testing only, and 4) bootstrap mode. The MC68HC11 is configured to run in the bootstrap mode when operating in the W/E cycle system. When configured in the bootstrap mode, the MC68HC11 is capable of receiving a serial stream of data via its serial communications interface (SCI) and storing the data to RAM. Once the serial transmission is received, the M68HC11 vectors to the beginning of RAM and executes the code.

Write / Erase System Hardware

The W/E system consists of two boards, a device under test (DUT) board, shown in Figure 2, and a driver board, depicted in Figure 3. The driver board controls the W/E stress of the M68HC11's, which are placed on the DUT board. The two boards interface via an edge connector. In production, W/E cycling occurs at 125 C. Thus, the DUT board is placed inside a high temperature oven and connects to the driver board located outside the oven through the edge connector which is placed inside the oven wall.

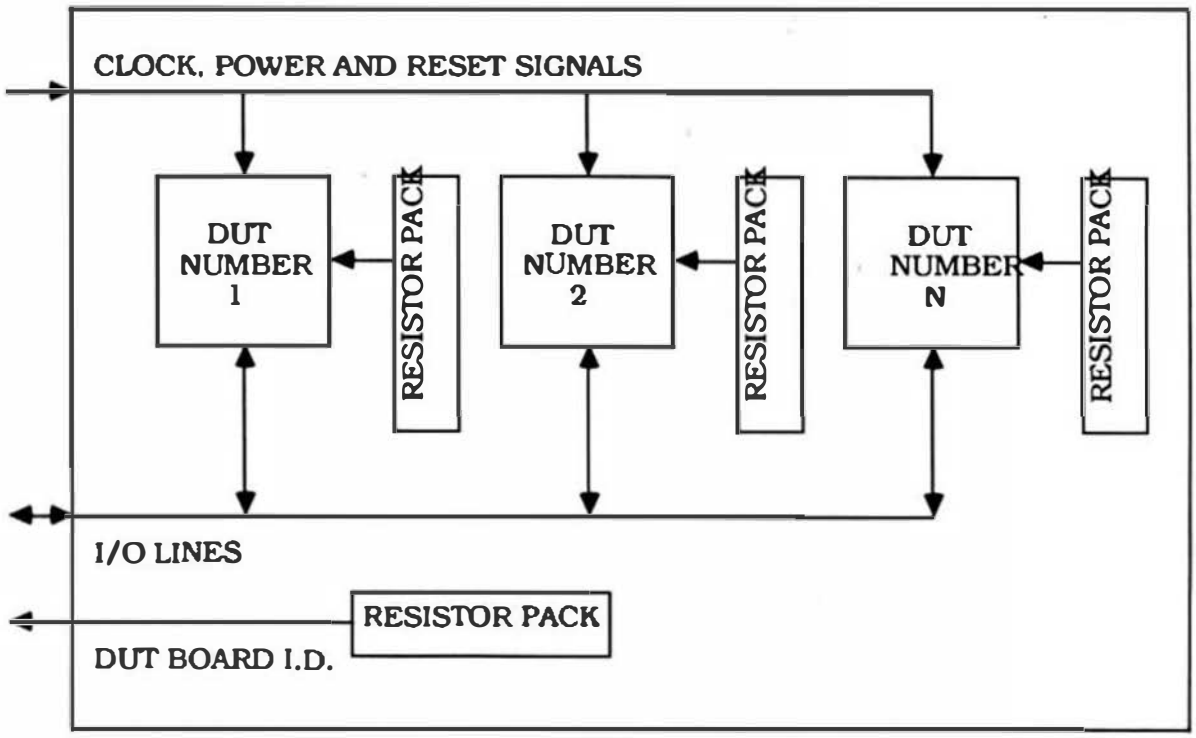


FIGURE 2 W/E SYSTEM DEVICE UNDER TEST BOARD.

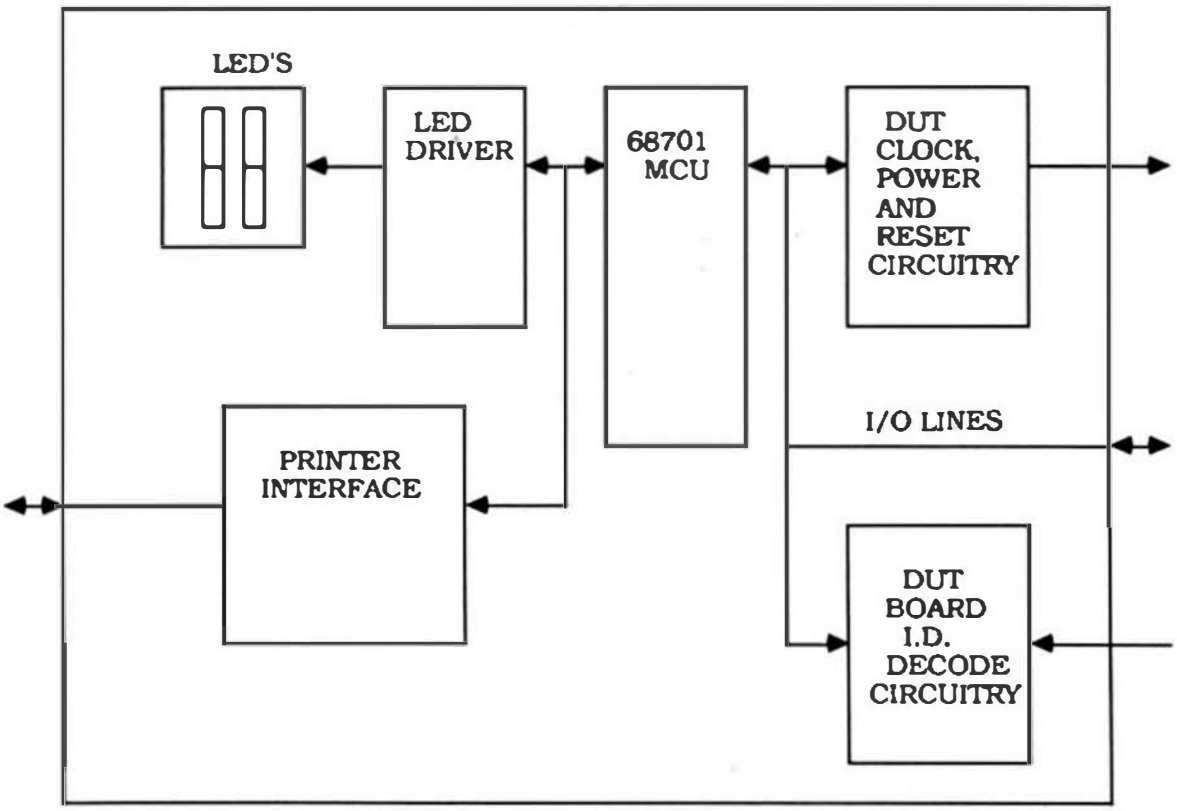


FIGURE 3 W/E SYSTEM DRIVER BOARD BLOCK DIAGRAM.

The MC68HC11 DUT board contains little circuitry outside of the MCU's themselves. Each MC68HC11 connects to an I/O bus in order to communicate with the driver board. Via the DUT socket, the port E pins of each MCU are hardwired with a hexadecimal address equivalent to the socket number in which it is placed. Since the I/O signals are bussed, this address is used by each DUT to discern whether the driver is initiating communication with itself or another DUT. Clock, power and reset signals are also obtained from the driver board. The DUT's operate at an E clock frequency of 1.0 MHz with a 5.5 volt supply. Lastly, the DUT board contains a hardwired board identification code to inform the driver board of the package type and quantity of MC68HC11's on the DUT board. DUT boards were made to support 48 pin DIP, and 52 and 68 pin PLCC packages. (Note: see MC68HC11 Data Sheets for package information on particular MC68HC11 MCU devices.) Table 2 lists the quantity and the package type of the MCU's for the respective DUT board codes.

RESISTOR PACK NODE			DUT PACKAGE TYPE	DUT QUANTITY
N1	N2	N3		
0	0	0	PLCC	30
0	0	1	PLCC	50
0	1	0	DIP	15
0	1	1	DIP	30

TABLE 2 DUT BOARD IDENTIFICATION CODE.

The driver board is primarily composed of a Motorola MC68701 MCU and several logic chips. The MC68701 MCU's features include 2k bytes of EPROM, 128 bytes of RAM, an SCI, and parallel I/O. The driver board consists of several sections which fascilitates its use in both a production and engineering environment. As cited earlier, the driver board contains circuitry which provides the DUT's with power, reset and clock signals. Several I/O lines are present to communicate with the DUT's. Additional circuitry enables the driver to determine the DUT board identification code. This information is used by the driver board to configure its I/O circuitry to properly communicate with the DUT board. The LED's and printer interface sections of the driver board are used to

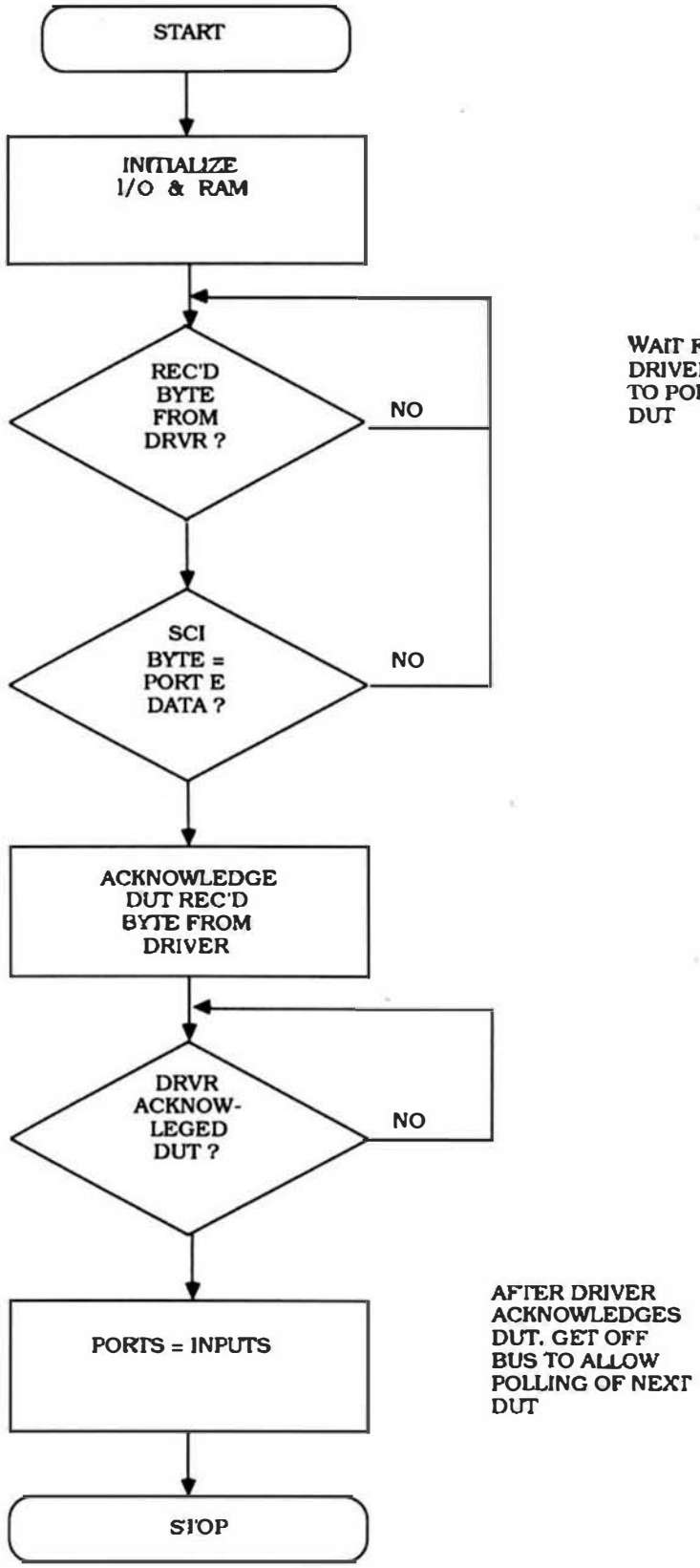


FIGURE 5 'QCHECK PROGRAM FLOWCHART.

interface with the user. Although a printer is not connected to the driver board during production W/E cycling, a push button switch contained in the printer interface is used to initiate W/E cycling. The printer is used extensively, however, in engineering evaluations as a data collection device.

System Operation and Software

The software program which runs the W/E cycle system consists of two parts: 1) M6801 driver board code and 2) M68HC11 DUT board code. Since the M68HC11 code is upwardly compatible with M6801 code, the two programs were combined into one larger program, which is assembled using an M68HC11 crossassembler. Care must be taken to assure that no M68HC11 specific opcodes are included in the M6801 portion of code, since the MC68701 MCU will view the opcodes as illegal instructions.

Once assembled, the software to operate both the driver and DUT boards is programmed into the driver board's MC68701 MCU. As mentioned previously, the DUT MC68HC11's operate in the bootstrap mode which enables them to use their SCI to read a program into on-chip RAM and execute the program. This special feature of the MC68HC11 bootstrap mode allows the driver board to download the MC68HC11 portion of the code to all the DUT's simultaneously. Programs downloaded to the DUT's are limited in size to 256 bytes in order to completely fit in the RAM area of all the MC68HC11's. Programs are serially downloaded from the driver board via the MC68701 MCU's SCI to the DUT board at a rate of 4800 baud.

Once the M68HC11's are loaded onto the DUT board and both the driver and DUT boards are placed in their respective positions about the high temperature oven, the system is ready for use. The driver board controls the W/E cycle stress of the MC68HC11's in the manner outlined in Figure 4. After initializing itself upon power up, the driver board

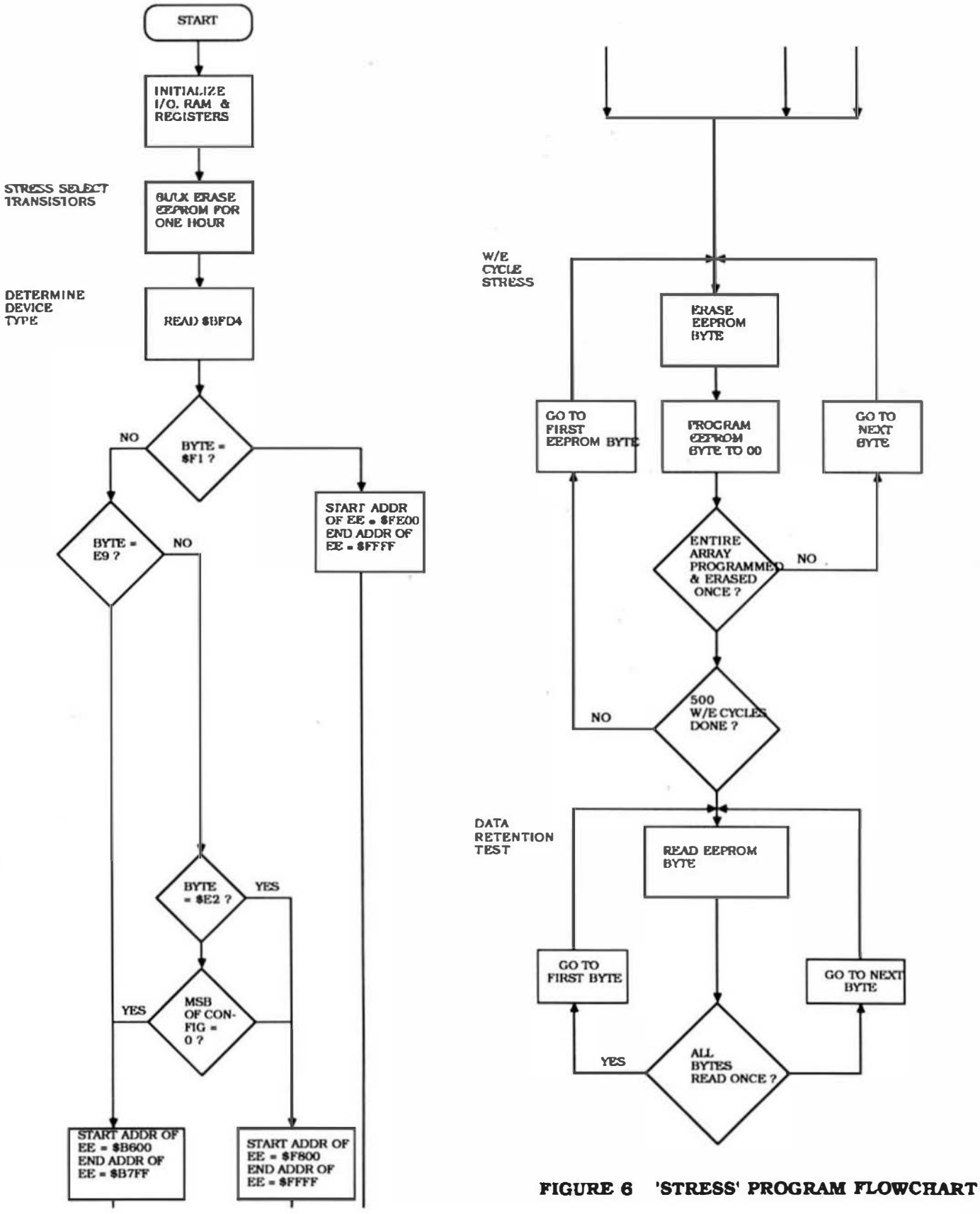


FIGURE 6 'STRESS' PROGRAM FLOWCHART

reads the DUT identification code to determine the type of DUT board in use. Recall, the driver board uses this information to properly configure buffers in order to communicate with the DUT board. If an invalid code is read, which would be the case if the boards were not properly connected, an error code would be displayed on the LED's.

Once properly configured for communication, the driver board downloads the 'QCHECK' MC68HC11 program to the DUT's. This program, outlined if Figure 5, is used to perform a quick socket check of the DUT's to assure that all the MCU's are properly seated within their sockets.

To perform a socket check, the driver board polls each DUT individually, and waits for the unit to respond. To poll a particular MC68HC11, the driver board transmits a data byte which corresponds to the socket number of the DUT. All of the DUT's simultaneously receive the data byte and compare it to the value hardwired to port E of their individual socket. When the data byte received matches the port E value, the MCU responds. After the proper handshake signals are exchanged, the MC68HC11 clears the signals applied to the I/O bus enabling the driver board to poll the next device.

After polling all of the devices, the driver board displays the socket number(s) of the DUT('s) which did not respond. This allows the user to power down the system and reinsert any device which is not correctly positioned. If all the DUT's respond, the display will flash 00. The driver board will continue to display the socket numbers which did not respond until the user presses a button on the driver board to initiate W/E cycling. Before cycling is initiated, however, the oven in which the DUT boards are placed is heated to 125 C.

Once the appropriate button is pressed, the driver board writes a continuous 00 to the LED's to indicate that W/E cycling was initiated. A second program, 'STRESS', outlined in Figure 6, is then downloaded to the DUT's. From this point on the driver board does not communicate with the MC68HC11's but solely provides them with power and clock signals. Additionally, all inputs from the user interface are ignored. Thus, W/E cycling can only be aborted by resetting the system.

Each DUT individually receives the 'STRESS' program and performs W/E cycling on its on-chip EEPROM. After initialization, the 'STRESS' software performs a one hour bulk erase of the entire EEPROM array. The bulk erase stresses the select transistors which are activated to access individual EEPROM bytes.

The 'STRESS' program was written to run on all current MC68HC11's, each with various EEPROM sizes and address locations as cited earlier (Table 1). Thus, once the one hour bulk erase is completed, the DUT must determine the size and location of its EEPROM. This is achieved by examining a location in boot ROM or the CONFIG register. On the newer MC68HC11 devices (E2, E9 and F1) boot ROM location $BFD4 contains data which identifies the particular device type. For example, an MC68HC11E9 device contains 'E9'. From this byte, the start and stop locations of EEPROM can be determined for these devices. The MC68HC11A8 and MC68HC811A2, on the otherhand, do not contain this boot ROM data byte. Thus, the CONFIG register is used to distinguish between these two devices. If the upper nibble of the CONFIG register is 0, then the device is an MC68HC11A8. A value other than zero indicates that the device is an MC68HC811A2.

Once the device type is determined, 500 W/E cycles are performed on each EEPROM byte in order to screen units which contain weak EEPROM floating gate cells. Once 500 W/E cycles are completed, a data retention test is performed. The data retention test takes the form of continuously reading each EEPROM byte in succession until the system is powered down. Upon completion of W/E cycling the EEPROM of each device should be fully programmed to 00.

Once W/E cycling is completed, the oven is cooled down and the DUT MC68HC11's are removed from the boards. The units then receive a full test on a high speed tester. During the post W/E cycle test, units which do not initially contain 00 in their entire EEPROM are binned out as bad devices.

Conclusions

The two board W/E cycle system is a cost effective efficient tool to screen MC68HC11 MCU EEPROM devices which may fail prematurely in an end user's system. This versatile system is used to stress five different MC68HC11 devices with one single software program.

As mentioned earlier, the W/E cycle system can also be used for engineering evaluations by altering the software programmed into the driver board MC68701 MCU and downloaded to the DUT's. Software changes enable the driver to collect data from the DUT's, and to print data via its user interface.

Additionally, the W/E system can be programmed to act as a gang programmer for MC68HC11 devices. Thus, up to 50 MCU's can be programmed simultaneously with one driver board and DUT board.

Bit-Bucket

By: All of us

"Contribute Nothing - Expect Nothing", DMW '86

MOTOROLA INC.

Microprocessor Products Group
6501 William Cannon Drive West
Austin, Texas 78735-8598

ALTOS ANNOUNCES MULTIUSER SYSTEM BASED ON MOTOROLA'S 68030

Seventh Company in Last Month to Announce 030-Based Computer

LAS VEGAS, Nev., Nov. 14, 1988 — Motorola's Microprocessor Products Group (Austin, Texas) today announced that Altos Computer Systems (San Jose, Calif.) will incorporate Motorola's top-of-the-line 68030 (030) processor in its highest performance multiuser system. The new computer, the Altos 68X Series 030, is configured to use two 25 MHz 030 chips and supports 250 users. The announcement was made at Comdex, a computer industry trade show.

The 030's compatibility with all processors in Motorola's 68000 family allows for easy migration of software from Altos' 68020-based products to its new 030-based multiuser system. Currently the 030 powers more than 50 systems, including personal computers and workstations from Apple Computer, Hewlett-Packard, NeXT and Sony Microsystems. These systems add to Motorola's $100 billion installed base of hardware and $3 billion base of 32-bit software, the world's largest.

Shernaz Daver
Cunningham Communication, Inc.
(408) 982-0400

Lisa Hadley
Microprocessor Products Group
(512) 440-3095

"Our 68000 family has always provided a growth path for companies," said Murray A. Goldman, senior vice president and general manager of Motorola's Microprocessor Products Group (Austin, Texas). "Our future 68040 will significantly increase the performance of systems while maintaining compatibility with current 68000-based machines."

The new Altos 68X Series 030 runs the Altos Pick operating system and is available in three configurations ranging in price from $25,000 to $45,000. All three configurations of the system will ship in the first quarter of 1989.

Founded in 1977, Altos designs, manufactures and markets 16- and 32-bit networked multiuser solutions for distribution in 70 countries. More than 108,000 Altos systems have been installed worldwide.

Motorola's $2.2 billion Semiconductor Products Sector (Phoenix, Ariz.), which includes the Microprocessor Products Group (Austin, Texas), is a part of Motorola Inc. It is the largest and broadest supplier of semiconductors in North America, with a balanced portfolio of over 50,000 devices.

NEW JAPANESE SYSTEMS ADOPT MOTOROLA'S 68030

Fujitsu, Sharp and Sumitomo-Denko Expand Portfolio of 030 Users

AUSTIN, Texas, Oct. 19, 1988 — Motorola's Microprocessor Products Group today announced that three major Japanese companies will incorporate its 68030 (030) microprocessor as the central processor in systems that are scheduled for shipment by the year's end. Fujitsu (Tokyo), the largest manufacturer of mainframes and minicomputers in Japan, will base two of its next-generation minicomputers on the 030. Sharp (Osaka) and Sumitomo-Denko (Tokyo) will both use the 32-bit processor in high-end workstations.

Fujitsu's 030-based A-60 and A-80 are the latest in the company's A-series of minicomputers to be based on Motorola's 68000 family. Sharp's IX-6 Model 2 and Sumitomo-Denko's U-Station/E40, both using the 030, are top-of-the-line engineering workstations that perform advanced CAD/CAM operations. The workstations add to Sharp and Sumitomo-Denko's current 68000-based product lines.

The 030's compatibility with processors in the 68000 line provides an easy upgrade path for more than 400 companies using its predecessor, the 68020. Currently, more than 50 companies use the 030 to power their systems. Sony Microsystems, the leading manufacturer of workstations in Japan, incorporates the 030 in its high-end workstations. Numerous companies in the United States, including Apollo Computer, Apple Computer, Hewlett-Packard and NeXT, Inc. also offer systems based on the 030.

"The versatility of the 030 allows it to be used in a variety of applications from personal computers to high-end workstations and supercomputers," said Murray A. Goldman, senior vice president and general manager of Motorola's Microprocessor Products Group (Austin, Texas). "The power of the 030 coupled with its price and installed software base continue to make it the choice of major systems companies."

The 030 is a highly integrated microprocessor with an internal parallel (Harvard-style) dual bus architecture, memory management unit, and separate 256-byte data and instruction caches on a single chip. All processors in the 68000 family are fully compatible with one another, allowing for easy migration of software. Currently, Motorola's 68000 family has a $100 billion installed base of hardware and a $4 billion 32-bit software base, the world's largest.

Motorola's $2.2 billion Semiconductor Products Sector (Phoenix, Ariz.), which includes the Microprocessor Products Group (Austin, Texas), is a part of Motorola, Inc. The company is the largest and broadest supplier of semiconductors in North America, with a balanced portfolio of more than 50,000 devices.

SONY INTRODUCES THREE WORKSTATION LINES BASED ON MOTOROLA'S 68030

AUSTIN, Texas, Oct. 31, 1988 — Motorola's Microprocessor Products Group today announced that Sony Microsystems, the leading manufacturer of workstations in Japan, will incorporate Motorola's 68030 (030) processor and 68882 (882) floating-point math coprocessor in three workstation lines. Sony joins a host of vendors including Apple Computer, NeXT and Fujitsu that have recently announced systems based on the top-of-the-line Motorola processor.

Sony's three workstation lines, the NEWS 1700, 1800 and 1900 Series, use a 25 MHz 030 as the central processing engine and a 25 MHz 882 for advanced numeric operations. The 1700 systems incorporate a single 030 processor and are targeted at computer-aided design tasks. The NEWS 1800 Series increases its own performance by including a second 030 as an input-output processor. The high-end NEWS 1900 workstation also uses a second 030 for graphics, networking and VME bus support. These Sony workstations provide a broad spectrum of cost-performance solutions for a range of markets including engineering, software development and network server applications.

"Sony is clearly a technology leader and we are proud that our 68000 family has contributed to its success," said Murray A. Goldman, senior vice president and general manager of Motorola's Microprocessor Products Group (Austin, Texas). "Our 68000 family will continue to deliver the performance needed for leadership in the workstation market."

Motorola's 68000 family consists of the 68000, 68010, 68020 and 68030. All members of the family are compatible with one another, allowing for easy software migration from Sony's 68020-based products to the new 030 based workstations. Currently, the 68000 family has established a $100 billion installed base of hardware and a $3 billion installed base of 32-bit software, the world's largest.

Sony Microsystems Company, headquartered in Palo Alto, Calif., is a wholly owned company of Sony Corporation of America, itself a division of the $11.4 billion Sony Corporation, Tokyo. Sony Microsystems markets state-of-the-art computer industry hardware and software in the United States.

Motorola's $2.2 billion Semiconductor Products Sector (Phoenix, Ariz.), which includes the Microprocessor Products Group (Austin, Texas), is a part of Motorola Inc. It is the largest and broadest supplier of semiconductors in North America, with a balanced portfolio of over 50,000 devices.

CERTIFIED SOFTWARE CORPORATION
P.O. BOX 70, RANDOLPH, VT 05060 USA TELEPHONE: 802-728-4062 FAX: 802-728-4126

CERTIFIED SOFTWARE ANNOUNCES BBS FOR OMEGASOFT PASCAL ON 68000 SYSTEMS

RANDOLPH, Vermont, October 19, 1988 - Certified Software today announced the installation of a Bulletin Board System to be used for customer support of the following products:

P20K - 68000 series Pascal for OS9 and PDOS hosts.
PXK9 - 6809 Cross Pascal for 68000 host running OS9.
PCSK - 68000 Pascal for Atari ST host.

The BBS allows users to call in using a modem at 2400 (V.22 bis), 1200 (V.22), or 300 (Bell 103) baud. The terminal program (supplied by Certified Software) allows error free communications with the BBS to facilitate downloading and uploading of programs reliably.

Access is on a subscription basis, with charges based on usage and a monthly account maintenance fee of $3. The minimum amount to open an account is $80, it is estimated that this would last the average user a year or more. Users apply for an account by logging into the system the first time and sending payment information to the BBS sysop (CSC).

The system is designed primarily to supply users with the latest information on OmegaSoft Pascal including patchs and work-arounds to known problems. There will also be free software available on the system, and users may exchange software they have written, and even purchase software from other users ($50 maximum per sale) by having money from their account transferred to the seller's account by the sysop.

The terminal program required to access the system will be included in future updates of existing products, or may be obtained from your distributor. Copies may be purchased directly from Certified Software at the above address for $10 with your prepaid subscription of $80 or more. Subscriptions may be charged to your credit card (VISA and Mastercard), credit card customers receive a 5% bonus.

®
OmegaSoft Pascal

MOTOROLA INC.

Semiconductor Products Sector

For further information, contact:

MOTOROLA INC.
Angela Hatfield, Press Relations, 602) 994-6900
Dev Chakravarty, Technical Marketing, (602) 821-4424

PCPI INC.
Steven J. Leon, Technopolis Communications, (213) 670-5606
Eric W. Gaer, Director of Marketing, (619) 485-8411

MOTOROLA, PCPI™ INTRODUCE NEW GENERATION OF LASER PRINTER CHIPS

Las Vegas, November 14, 1988 . . . Motorola Semiconductor Products Sector and Personal Computer Products Inc. (NASDAQ symbol: PCPI) today introduced the first of a new generation of application-specific integrated circuits (ASICs) that lowers the cost and improves the performance of laser printer controllers.

"The LPC1 and ALPC1 gate array circuits are the keystones of an integrated array of products and services for manufacturers of printer engines, vendors of laser printers and systems integrators," said Eric Gaer, director of marketing for PCPI.

"PCPI's OEM customers may now purchase or license all the elements needed to build and market any advanced laser printer product solution -- chips, the custom development of software and hardware, turnkey controller designs, complete printer systems, emulations, an extensive font library, and ImageScript™, PCPI's emulation of PostScript®.

In a related announcement, PCPI introduced two printer controllers that incorporate the LPC1 and ALPC1 chips.

The chips mold PCPI's expertise in systems and software design with Motorola's two-micron double-layer metal and advanced one-micron triple-layer metal CMOS (Complimentary Metal Oxide Semiconductor) semi-custom circuit technology.

The two companies announced in late August 1988 an agreement to jointly design, manufacture and market a new generation of ASIC chips "that promises developers the vehicle to provide users with less expensive printers that feature greater text-and-graphics capabilities," said Gaer.

Both the LPC1 and ALPC1 combine into a single integrated circuit a variety of printer operations that previously required several chips. This simplifies controller design and customization, enhances functionality, improves performance, lowers costs -- and frees board space for additional functions.

For example, the LPC1 integrates into a single chip the interface with the central processing unit, dynamic RAM control, and the direct memory access video interface. Additionally, the ALPC1 includes on-board hardware assist for raster operations.

The jointly-developed ALPC1 chip for laser-printer controllers represents the first commercially available application for Motorola's high-density CMOS array (HDC Series) family of one-micron triple-layer metal semi-custom circuits, introduced in November 1987.

The ALPC1 (Advanced Laser Printer Controller) chip incorporates one of the most advanced silicon technologies available to provide sub-nanosecond speed combined with extremely small chip dimensions. Features of Motorola's HDC Series include densities up to 105,000 gates in a channelless sea-of-cells architecture that provides over 75 percent typical utilization. A one-micron drawn-gate-length CMOS process having triple-layer metal routing and power distribution results in 260 picosecond typical gate delays and very small die size (226 mils square for 16K gates.) The circuits are packaged in economical PLCC and fine pitch QFP surface-mount configurations and PGAs for through-board applications.

L.J. Reed, vice president and general manager of Motorola's Application Specific Integrated Circuits Division, said "high utilization in a one-micron channelless array provides a combination of performance and economy ideally suited to building application specific controller circuits."

In addition to providing silicon technology matched to the laser printer market, Reed said "the Motorola-PCPI chips illustrate the use of specialized library cells to speed the design phase of creating customized print-engine controllers."

The Motorola-PCPI ASIC family is designed to enhance the performance and functionality of systems based on Motorola's line of MC680X0 microprocessors. They will support up to 40-page-per-minute printers and standard emulation of text and bit-mapped graphics, and they are compatible with the most commonly-used printer-engine interfaces.

In addition, the ALPC1 is designed to provide 68000-based printers with 68020 performance at the lower cost of the Motorola 68000 chip.

Motorola's Application Specific Integrated Circuits (ASIC) Division in Chandler, Arizona is dedicated to the development and production of semi-custom and structured custom circuits using gate array, cell-based and functional-block techniques. The ASIC Division manufactures and markets integrated circuits worldwide for commercial and military end-use markets and develops, acquires and maintains advanced computer-aided design software dedicated to the development and design of application-specific devices.

Located in San Diego, PCPI is a pioneer developer, manufacturer and marketer of laser printers and intelligent, microprocessor-based board-level products designed for use with leading microcomputers and workstations.

MOTOROLA INC.

THE LPC1:

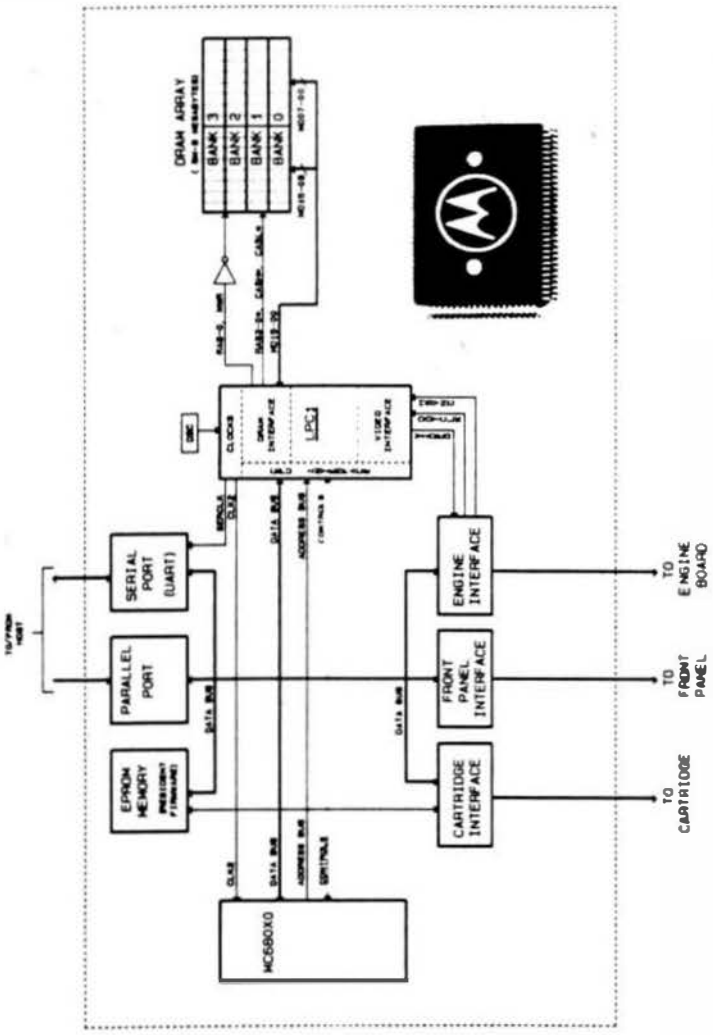
A LASER PRINTER CONTROLLER INTERFACE CHIP

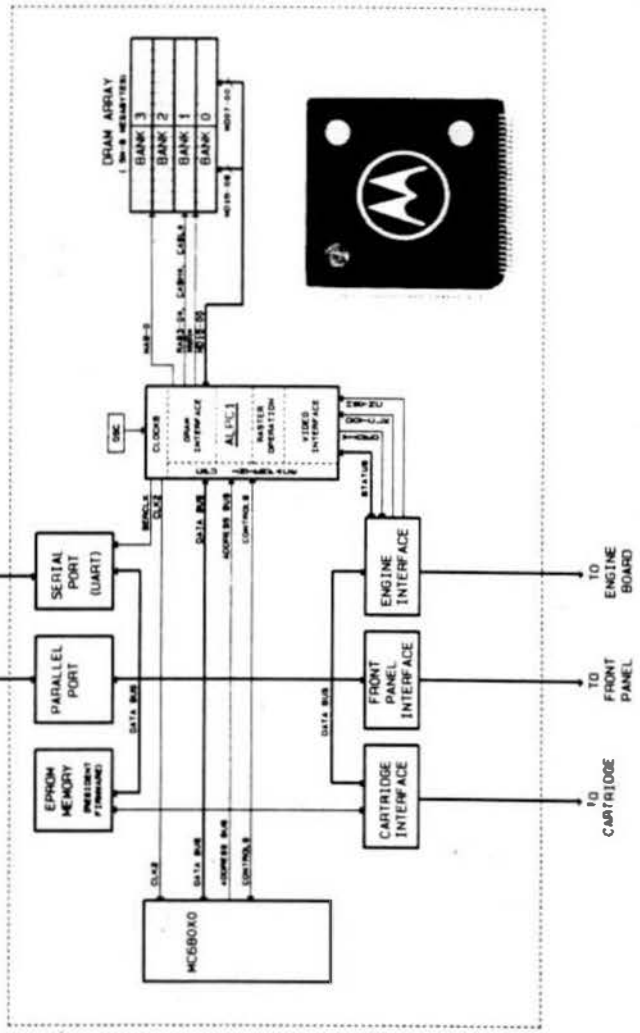
The LPC1 is the first of a new generation of Laser Printer Controller chips. It incorporates the three primary functions of a laser printer controller: the CPU interface, the Dynamic RAM control and the video DMA interface. The LPC1 is fully compatible with Motorola's line of MC680X0 microprocessors.

Contained within the LPC1 are eight programmable registers which provide a wide range of flexibility in customizing the LPC1 for a specific engine application. On-board CPU clock driver, programmable serial port clock, 16-bit interrupt timer, and a special CPU controlled Diagnostic printer emulation mode are just a few of the LPC1's unique features.

FEATURES

- **CPU INTERFACE**
  - MC680X0 Interface (-16, -12 MHz)
  - CPU Clock Generator
  - Variable DTACK Selection
  - CPU Interrupt or Polling Option
  - CPU Controlled Diagnostic Printer Emulation Mode
  - 16-bit Programmable Software Interrupt Timer
  - 16-bit Data Bus
- **DRAM CONTROL**
  - 0.5M - 8 Megabytes DRAM Controller
  - 256K and 1Meg DRAM Chip Support
  - 3-Port Memory Interface Arbitration (CPU, Video DMA, Refresh)
  - Internal Refresh Cycle Control (RAS-Only)
- **VIDEO DMA INTERFACE**
  - Video DMA with selectable Write-back Zero Option
  - 16-bit Programmable Vertical Line Scan Counter with Interrupt or Polling Option
  - Internal/External LGATE Option
  - Internal 12-bit Programmable LGATE Counter
  - 12-bit Programmable Words/Line Counter
  - 22-bit Programmable Video DMA Memory Address Counter with optional Auto Wrap on Scan Counter Interrupt





THE ALPC1:

AN ADVANCED LASER PRINTER CONTROLLER INTERFACE CHIP

The ALPC1 is the first of a new generation of Advanced Laser Printer Controller chips. It incorporates the three primary functions of a laser printer controller: the CPU interface, the Dynamic RAM control and the print engine video DMA & status interface. Additionally, the ALPC1 contains on-board hardware assist for raster operations. The ALPC1 is fully compatible with Motorola's line of MC68CX0 microprocessors and is a superset of MCPI's first generation LPC1 chip.

Contained within the ALPC1 are several programmable registers which provide a wide range of flexibility in customizing the ALPC1 for a specific engine application. On-board CPU clock driver, programmable host serial port clock, 16-bit interrupt timer, engine interface serial port and a special CPU controlled Diagnostic printer emulation mode are just a few of the ALPC1's unique features.

FEATURES

- **CPU INTERFACE**
  - MC68020 interface (16-16 MHz sync & 16-25 MHz asynchronous operation)
  - CPU Clock Generator
  - Variable DTACK Selection
  - CPU vectored Interrupt or Polling Option
  - CPU Controlled Diagnostic Printer Emulation Mode
  - 16-bit Programmable Software Interrupt Timer
  - 16-bit Data Bus
  - Zero wait state cycle, 1 wait state Read cycle
- **RASTER OPERATIONS**
  - 3 Operand Raster Operations (source, mask, destination)
  - Hardware Source Alignment to Destination
  - Automatic Destination Address Generation
  - Data Preservation (Clipping) on Overrun
- **DRAM CONTROL**
  - 0.5M - 8 Megabytes DRAM Controller
  - 256K and 1Meg DRAM Chip Support
  - 3-Port Memory Interface Arbitration (CPU, Video DMA, Refresh)
  - Internal Refresh Cycle Control (RAS-Only)
- **VIDEO ENGINE INTERFACE**
  - Video DMA with selectable Write-back Zero Option
  - 16-bit Programmable Vertical Line Scan Counter with Interrupt or Polling Option
  - Internal 12-bit Programmable LGATE Counter
  - 12-bit Programmable Words/Line Counter
  - 22-bit Programmable Video DMA Memory Address Counter with optional Auto Wrap on Scan Counter Interrupt
  - Engine command, status Serial Port interface

Computer Systems Consultants, Inc.
1454 Latta Lane, Conyers, GA 30207
Telephone Number 404-483-4570/1717

CMODEM

CMODEM is a menu-driven telecommunications program designed to facilitate the transmission of data between microcomputer systems and terminals or bother remote computer systems. It functions in several modes of operation.

In the simplest mode of operation, it provides a transparent dumb-terminal method of communication. For MS-DOS-compatible computers, it also provides a tvi-920 emulation.

It also supports the Ward Christiansen file transfer protocol to facilitate the error-free transfer of files between systems both supporting this protocol. The default error-checking method used is checksum. CMODEM will acknowlege CRC error checking and will switch if requested by the other computer. This feature allows the use of CMODEM with most available upload/download facilities.

For those systems that do not support a batch transfer protocol, CMODEM supports an ASCII file collection/dump mode for transfer of text files. In this mode, and in dumb-terminal mode, it supports an X-ON/X-OFF mode of controlling the data transmission.

CMODEM will work at speeds of 300 to 9600 Baud for those systems with asynchronous communications support devices. It is used regularly at 9600 Baud between adjacent machines to transfer data between them.

The CMODEM program with printed manual is available for a retail price of $50 without source or $100 with source.

68010 SUPER SLEUTH

A disassembler performs a function opposite to that of an assembler. That is, it allows its user to process an object program, for which no source program is readily available, and to re-create the essentials of the original source program. The resultant source program may then be studied, commented, modified, reassembled, etc. A trivial disassembly may be performed rather simply manually or with the use of a computer by translating the successive bytes of object code into the equivalent mnemonics for a target processor. A really useful disassembly requires the assignment of labels and the ability to determine whether given bytes in the program represent data, addresses, garbage, or instructions. Since a computer can assign labels but cannot classify program contents, disassembly must be interactive to be meaningful.

SUPER SLEUTH is a collection of programs which enables the user to interactively examine Motorola S-format program files on disk. 68010 programs may be disassembled into source code format and the source saved on disk.

Programs in other binary formats may be placed into Motorola S-format with utility programs provided with SUPER SLEUTH. Labels produced by SUPER SLEUTH can be changed globally to labels of your own preference. Cross reference listings of labels can be produced to aid in debugging or modifying the program.

SUPER SLEUTH, with printed manuals, is available in object-only form for a retail price of $100, or with source for $200.

P A L M B E A C H S O F T W A R E
7080 HYPOLUXO FARMS RD.
LAKE WORTH, FL 33463
(407) 965-2657

CONGRATULATIONS on the purchase of your PT-68K2. I have been selling and using Peripheral Technology products for the past 6 years and my customers and I are very happy with their products, service and support. Since 1978 I have been developing business oriented programs for the Motorola 6800 & 6809 and I am now converting them to the 68000. The following products are available from Palm Beach Software.

EDDI a screen editor and formatter. $50.00
EDDI has 62 key commands to completely manage the text and screen display, and 22 formatting commands to control the printed output. It is also convenient for use as a program editor supporting line numbers, tab stops and macro keys. A spelling helper, synonym finder and other DOS utilities are available without exiting EDDI. Two banks of memory are supported so that you can edit two files and move data back and forth. DOCUMAKER (a boiler plate document creator) and MERGER (personalized name, text and address insertion) will be available in late 1988.

SPELL8 a 160,000 word spelling checker. $50.00
SPELL8 has been around in the 6809 version for 5 years. It is still on version 1.0 and I have only fixed two misspellings.

ASMK a native code assembler. $25.00
ASMK is a bare bones, native code, 68000 assembler. It does not have macros or conditional assembly and you must have enough memory to hold the complete source and object code. The syntax is similar to other 6800 and 6809 assemblers which were common to the SS-50 world. It is very fast.

SUBCAT a sub-directory manager. $25.00
SUBCAT is a program that will allow multiple directories; setup in a tree structure on a disk. The disk directory is not altered and is still the primary source of information about each file. Each entry has a 36 byte message area where you can keep a description of the file and its contents. A long block of reverse video is moved to select an entry and now you can execute the following operations on the selected file. Assemble, copy, delete, edit, get or execute, help, kill, install, load, enter message, rename and view. Other operations; backup, execute DOS command, scan, update, zap and exit can be done from any position. Two other commands are user definable. In essence you can create a tree like catalog structure and then manipulate the files in these catalogs as an independent directory.

KRACKER a disassembler program. $25.00
KRACKER will allow you to scan through a program to create a memory map of code, text, tables, etc. When the memory map is competed you can create a source code file to disk, printer, or terminal.

LOGIC a schematic drawing prog. (graphic screen only) $25.00

MOZART a music editor (requires special card) $25.00

The following program is underdevelopment and is expected to be released in the third quarter of 1988.

PARASOL a complete integrated business system.
PARASOL is a alternate tasking, memory management, menu driven, umbrella or shell program for the PT-68K2. The main menu can be reentered from any program, where you may select another task. This task may also reenter the main menu and select again. When you exit a task you will be returned to the previous task at the exact point where you left with all pointers, flags and screens restored. At the present time the following programs and desk accessories are either working or under development. Multiuser version can be expected in the fall of 1988.

APPOINTMENT Calendar
BILLS PAYABLE
COMMUNICATIONS PACKAGE (Email, Modem Management, etc)
DIARY (Note pad data base organized by name & ID#)
EQUIPMENT (Data base of property (depreciation, loans & borrows))
FILE ROOM (Main data base organized as Cabinets (disks), Drawers (directories), Folders (sub-directories), Documents (files). After a document has been selected you will then have the option to edit, view, rename, copy, send, delete, assemble, etc.
GENERAL LEDGER (complete double entry accounting package)
HOUSEKEEPING (daily journal & posting to all accounts)
INVOICE GENERATOR (create invoices and delivery tickets)
JOB JAR (data base of things to do)
COST ACCOUNTING (integrated with bills received & payroll)
TIME LOG & MANAGEMENT (professional time monitor for billing)
FILE MAINTENANCE (where all boo-boos are corrected)
NAME & ADDRESSES (main data base as most other files are referenced to the personal ID#.
PURCHASE ORDERS (data base of orders placed)
PAYROLL (1000 employees, checks, monthly, quarterly, yearly reports and W2's)
EMERGENCY EXIT (menu of shutdown procedures)
RECEIVED ON ACCOUNT (integrated with invoice generator to keep record of charges and payments, statements, past due report)
SPREAD SHEET
TELEPHONE & DIALER (dial telephone and keep record of time & charges)
UTILITY ROUTINES
INVENTORY (manage the inventory integrated with invoice generator)
EXPENSE ACCOUNTING (log & manage expense accounts)

Palm Beach Software programs are written in assembly language for speed and efficient use of ram and disk memory. They are not copy protected and the source code is made available for the modules that are user defined. (Printer drivers, Terminal drivers, Modem drivers and Key selection tables) A smart terminal is required for our business software. I recommend the Televideo 905, but the Wyse WY-50 is also a good choice. A smart terminal emulator program has been written for the monographics card and AT style keyboard. However: If you plan in the future to use the business programs, either single or multiuser, a smart terminal should be used. Please include a discription of your system with each order. Software will be distributed on 5 1/4" disks, Single Sided, Double Density, and 96 TPI unless a special request is made.

Happy Hacking,

Dan Farnsworth

GESPAC Inc.
50 West Hoover Ave.
Mesa, Arizona 85210
Tel. (602) 962-5559
Fax. (602) 962-5750

Reader Contact: Don Bizios
Editorial Contact: Cosma Pabouctsidis

DO NOT RELEASE UNTIL 12/15/88

80286 G-64 BOARDS SET HELPS BUILD RUGGED IBM PC AT COMPATIBLE SYSTEM

Mesa, AZ, November 1, 1988--GESPAC has released a board set implementing the Intel 80286 16-bit processor, EGA graphics, and disk controller that is compatible with the IBM AT running at 10 MHz. The three boards are each built under the single height Eurocard form factor, use the reliable DIN 41612-C connector, and are designed to operate on the G-64 bus. The unique mechanical characteristics and bus extension capability of the board set makes it ideal for use in applications where a harsh or vibrating environment would prohibit the use of a regular office PC or compatible.

The first of the boards is a highly integrated industrial implementation of Intel's high performance 80286 16-bit microprocessor. The microprocessor has 512K of fast access on-board dynamic memory and sockets for the EPROM BIOS. For math intensive operations, an 80287 arithmetic coprocessor can be added. In addition, the board includes two RS-232 serial ports, three timers, a battery backed-up clock and calender, as well as a powerful interrupt controller.

The second member of the system is an Enhanced Graphics Adapter (EGA) that features an integral AT keyboard interface. This brings PC compatible color graphics to the industrial environment. The third member of the system is a hard disk controller to be used under the ST-506 interface under the G-64 bus, giving the user the option of using a vast number of hard disks, as well as capacities at a low cost.

All three boards communicate through a standard G-64 bus backplane. The G-64 bus is a 16/32-bit open bus architecture, featuring the single height Eurocard board format (4" by 6.25"), that is widely used in industrial and imbedded systems application. The bus interface allows the board set to be expanded with any of over 150 I/O, data acquisition or controller modules available for the bus.

The board set has been demonstrated to run all the most popular programs written for the IBM PC AT.

Commodore NEWS

For further information
contact Valerie Bellofatto or
Lori Cross at Fleishman-Hillard
(213) 629-4974

COMMODORE INTRODUCES AMIGA® WITH 68020

Amiga 2500 features doubled processor speed, math-co-processor and 2 MB of 32-bit RAM for workstation-level applications

LAS VEGAS, November 14, 1988 -- Commodore Business Machines, Inc. today introduced the Amiga 2500 designed for the needs of graphics, animation and video professionals. Based on the original Amiga 2000 introduced a year ago, the Amiga 2500 is configured with an A2620/2 co-processor card that comes standard with the Motorola® 68020 processor, 2 MB of 32-bit RAM (expandable to 4 MB) and a 68881 math-co-processor. These high-performance features enable the new Amiga system to perform at the workstation-level speeds required by many of the new second generation graphics-based Amiga applications.

"The Amiga 2500 is a natural progression of the Amiga technology," said Joel Shusterman, Commodore vice president of marketing. "The Amiga 2500 has no equal in its price/performance class and offers all of the original design benefits of the Amiga 2000 as an expandable, multi-tasking, multi-processing, multi-operating system machine."

The advanced graphics capability of the Amiga series is ideally suited to color desktop publishing and presentation, 3-D solid modeling and professional video applications. With the additional speed of the Amiga 2500, color rendering time of 3-D graphics and re-calculation time for modifying full-color desktop publishing pages can be reduced substantially. Performance increases can be up to 400 percent.

Standard on the Commodore Amiga 2500 is a Motorola 68020-based co-processor card (A2620/2) running at 14.26 Mhz with 2 MB of 32-bit RAM, (expandable to 4 MB of 32-bit RAM); a built-in 3.5-inch floppy disk drive; a pre-configured, high-performance 40 MB hard disk drive and hard disk controller; custom sound, animation and graphics chips; RS232 serial and parallel connectors; and two RCA-type audio output jacks. Also available is an MS-DOS® compatible Bridgeboard allowing the Commodore Amiga to run MS-DOS compatible software under Amiga control.

The open architecture of the Commodore Amiga allows extensive internal expansion with multi-processor, multi-DOS options. Contained in the Amiga 2500 are seven full-size internal expansion slots which include a combination of Amiga, standard PC XT/AT and dual purpose slots; a CPU expansion slot and a video expansion slot.

FORCE COMPUTERS, INC.
3165 Winchester Blvd
Campbell, CA 95008-6557

Product News

Prepared By:
Shohat & Davis PR
2959 S. Winchester Blvd, Campbell, CA 95008
Murry Shohat (408) 379-7434

Contacts:
FORCE USA: Wayne Fischer (408) 370-6330
FORCE GmbH: Anton Nausch (089) 600-910

Extraordinary 68030-based Single-Board Computer Offers Large Number of Functions at Low Price

Cost/Performance Breakthrough with Options on Speed, Memory, SCSI, Floppy and Ethernet

CAMPBELL, CA., October 18, 1988 — A new high-end 68030-based single board computer introduced today brings cost-efficient modularity to high performance 32-bit applications. The CPU-37 offers more functionality than most single-board VMEbus-based computers. The board offers a range of options on CPU speed, on-board memory and floppy, SCSI and Ethernet control. When fully configured, this single-board computer replaces solutions that use up to four boards. FORCE has priced the CPU-37 below any comparable single or multi-board offering.

The CPU-37 also offers an ASIC solution to VMEbus interface and control. "Using our advanced VME/PLUS™ architecture, we married high-density application-specific gate array technology with precision surface-mount board manufacturing," said Wayne Fischer, Director of Marketing. "We're able to offer more functions in a single board computer for less dollars, thanks to VME/PLUS. The CPU-37 will serve the low-to-middle reaches of the demanding high-performance market segment. Customers can select CPU speeds of either 16.7 or 25 MHz, on-board DRAM of either 1 or 4 Mbytes, and say yes or no to Ethernet."

Standard Features Will Attract Mid-Range, Embrace High-End Applications

The most basic CPU-37 is priced as low as $3,990 but offers features associated with boards costing hundreds more. A fully configured CPU-37 is priced at $5,890 and includes all features described below. "We're bound to attract applications that up until now have been too cost-sensitive to move to a 68030-based CPU," said Fischer. "And, high-end buyers will see the CPU-37 as a price-performance breakthrough."

The CPU-37's ranges of features include:

- 68030 microprocessor, 16.7 or 25 MHz operation; 2 E^2PROM sockets
- 68882 floating point coprocessor, 16.7 or 25 MHz operation
- 1 or 4Mbytes of DRAM, 0 wait states at 16.7 MHz, 1 wait state at 25MHz
- Real time clock with on-board battery backup
- 3 serial ports for RS232/RS422 operation available via 9-pin front panel connectors. First 2 ports can provide synchronous operation based on the 68562 dual universal serial communications controller chip; 3rd port employs the 68901 multi-function peripheral chip.
- 1 Parallel Interface/Timer provides one 24-bit and four 8-bit timers
- SCSI interface (via MB87031 host adapter chip)
- Floppy Disk Controller (SA460) interface (via WD1772 controller chip)
- Optional Ethernet transceiver interface (front panel access) with 64 Kbyte dedicated buffer, based on the AMD 7990 LANCE chip
- VME/PLUS architecture embodied in FGA-001, a 135-pin CMOS gate array with 1.5 micron feature size. The array consumes less than 120 milliwatts, features remarkably low gate delays (1.4 ns) and is capable of an internal toggle frequency of 200 Mhz and external toggle frequency of 70 MHZ. This array provides VMEbus interface and control functions including DSACK generation, bus error generation, system reset, bus clock and all on-board control logic.
- A32/24/16, D32/24/16/8 VMEbus master/slave interface
- Slot 1 Control functions (SYSCLOCK, arbiter, etc.)

Software Includes Free O/S Kernel, Wide 3rd-Party Compatibility

Enhancing the usefulness of the CPU-37 is VMEPROM, a free real-time operating system kernel that also includes a monitor and debugger. It is installed on the board in EPROM, yielding operational capability as soon as the CPU-37 is installed on an active backplane.

VMEPROM is based on PDOS, a popular operating system from Eyring Research Institute.

The CPU-37 is also compatible with third-party real-time systems and kernels, including UNIX compatible products. Current third-party ports include OS-9 (Microware), VRTX32 (Ready Systems), pSOS (Software Components Group), VxWorks (Wind River Systems) and UNIFLEX (TSC).

Support for Ethernet's TCP/IP protocol is planned for 1Q89.

Price & Availability

The CPU-37 has entered the shipping pipeline and is available for immediate delivery. Equipped with a 16.7MHz 68030 and 68882 math coprocessor, 1MB of memory, floppy and SCSI controllers, the CPU-37X is priced at $3,990 (1-9). A 25MHz version with 4MB of memory, floppy, SCSI and Ethernet controllers is priced at $5,890. The product is shipped in a new FORCE package that emphasizes static protection.

About Force Computers

The leading independent designer and manufacturer of VMEbus products, Force is now in its sixth year. The company has completed 23 consecutive quarters of profitable operation. Force is headquartered in Campbell, California with subsidiaries in West Germany, France and the United Kingdom. Sales, service and product support are provided on a worldwide basis.

ATARI & AMIGA CALL

As most of you know, we are very sensitive to your wishes, as concerns the contents of these pages. One of the things that many of you have repeatedly written or called about is coverage for the **Atari & Amiga™** series of 68000 computers.

Actually we haven't been too keen on those systems due to a lack of serious software. They were mainly expensive "game-toy" systems. However, recently we are seeing more and more honest-to-goodness serious software for the Atari & Amiga machines. That makes a difference. I feel that we are ready to start some serious looking into a section for the Atari & Amiga computers. Especially so since **OS-9** is now running on the Atari (review copy on the way for evaluation and report to you) and rumored for the Amiga. Many of you are doing all kinds of interesting things on these systems. By sharing we all benefit.

This I must stress - *Input from you on the Atari & Amiga*. As most of you are aware, we are a "contributor supported" magazine. That means that YOU have to do your part. Which is the way it has been for over 10 years. We need articles, technical, reviews of hardware and software, programming (all languages) and the many other facets of support that we have pursued for these many years. Also I will need several to volunteer to do regular columns on the Atari & Amiga systems. Without constant input we can't make it fly! So, if you do your part, we certainly will do ours. How about it, drop me a line or give me a phone call and I will get additional information right back to you. We need your input and support if this is to succeed!

DMW

THE 6800-6809 BOOKS

..HEAR YE.....HEAR

OS-9™ User Notes

By: Peter Dibble

The publishers of 68' Micro Journal are proud to make available the publication of Peter Dibbles
OS9 USER NOTES

Information for the BEGINNER to the PRO, Regular or CoCo OS9

Using OS9
HELP, HINTS, PROBLEMS, REVIEWS, SUGGESTIONS, COMPLAINTS, OS9 STANDARDS, Generating a New Bootstrap, Building a new System Disk, OS9 Users Group, etc.

Program interfacing to OS9
DEVICE DESCRIPTORS, DIRECTORIES, "FORKS", PROTECTION, "SUSPEND STATE", "PIPES", "INPUT/OUTPUT SYSTEM", etc.

Programming Languages
Assembly Language Programs and Interfacing; Basic09, C, Pascal, and Cobol reviews, programs, and uses; etc.

Disks Include
No typing all the Source Listings in. Source Code and, where applicable, assembled or compiled **Operating Programs.** The Source and the Discussions in the Columns can be used "as is", or as a "Starting Point" for developing **your OWN** more powerful Programs. Programs sometimes use multiple Languages such as a short Assembly Language Routine for reading a Directory, which is then "piped" to a Basic09 Routine for output formatting, etc.

BOOK $9.95

Typeset -- w/ Source Listings
(3-Hole Punched; 8 x 11)
Deluxe Binder - - - - - - - - - - $5.50

All Source Listings on Disk

1-8" SS, SD Disk - - - - $14.95
2-5" SS, DD Disks - - - $24.95

FLEX™ USER NOTES

By: Ronald Anderson

The publishers of 68 MICRO JOURNAL are proud to make available the publication of Ron Anderson's **FLEX USER NOTES**, in book form. This popular monthly column has been a regular feature in 68' MICRO JOURNAL SINCE 1979. It has earned the respect of thousands of 68 MICRO JOURNAL readers over the years. In fact, Ron's column has been described as the 'Bible' for 68XX users, by some of the world's leading microprocessor professionals. The most needed and popular 68XX book available. Over the years Ron's column has been one of the most popular in 68 MICRO JOURNAL. And of course 68 MICRO JOURNAL is the most popular 68XX magazine published.

Listed below are a few of the **TEXT** files included in the book and on diskette.

All TEXT files in the book are on the disks.

LOGO.C1	File load program to offset memory — ASM PIC
MEMOVE.C1	Memory move program — ASM PIC
DUMP.C1	Printer dump program — uses LOGO — ASM PIC
SUBTEST.C1	Simulation of 6800 code to 6809, show differences — ASM
TERMEM.C2	Modem input to disk (or other port input to disk) — ASM
M.C2	Output a file to modem (or another port) — ASM
PRINT.C3	Parallel (enhanced) printer driver — ASM
MODEM.C2	TTL output to CRT and modem (or other port) — ASM
SCIPKG.C1	Scientific math routines — PASCAL
U.C4	Mini-monitor, disk resident, many useful functions — ASM
PRINTC4	Parallel printer driver, without PFLAG — ASM
SET.C5	Set printer modes — ASM
SETBAS1.C5	Set printer modes — A-BASIC

NOTE: .C1,.C2, etc.=Chapter 1, Chapter 2, etc.

**Over 30 TEXT files included is ASM (assembler)-PASCAL-PIC (position independent code) TSC BASIC-C, etc.

Book only: **$7.95** + $2.50 S/H

With disk: 5" **$20.90** + $2.50 S/H

With disk: 8" **$22.90** + $2.50 S/H

Shipping & Handling $3.50 per Book, $2.50 per Disk set
Foreign Orders Add $4.50 Surface Mail
or $7.00 Air Mail
If paying by check - Please allow 4-6 weeks delivery
* All Currency in U.S. Dollars

Continually Updated In 68 Micro Journal Monthly

VISA

Computer Publishing Inc.
5900 Cassandra Smith Rd.
Hixson, TN 37343

(615) 842-4601
Telex 5106006630

"FLEX is a trademark of Technical Systems Consultants
"OS9 is a trademark of Microware and Motorola
"68' Micro Journal is a trademark of Computer Publishing Inc.

!!! Subscribe Now !!!
68 MICRO JOURNAL

OK, PLEASE ENTER MY SUBSCRIPTION

Bill My: Mastercard ☐ VISA ☐

Card #_____ Exp. Date_____

For 1 Year ____ 2 Years ____ 3 Years ____

Enclosed: $_____

Name _____

Street _____

City _____ **State** _____ **Zip** _____

Country _____

My Computer Is: _____

Subscription Rates

U.S.A.: 1 Year $24.50, 2 Years $42.50, 3 Years $64.50

***Foreign Surface: Add $12.00 per Year to USA Price.**

***Foreign Airmail: Add $48.00 per Year to USA Price.**

***Canada & Mexico: Add $9.50 per Year to USA Price.**

***U.S. Currency Cash or Check Drawn on a USA Bank !**

68 Micro Journal
5900 Cassandra Smith Rd.
POB 849
Hixson, TN 37343

Telephone 615 842-4600
Telex 510 600-6630

Reader Service Disks

Disk- 1	Filesort, Minicat, Minicopy,Minifms, **Lifetime, **Poetry, **Foodlist, **Diet.
Disk- 2	Diskedit w/ inst.& fixes, Ptime, *Pmod, **Snoopy, **Football, **Hexpawn,**Lifetime.
Disk- 3	Cbug09, Sec1, Sec2, Find, Table2, Intext, Disk-exp, *Disksave.
Disk- 4	Mailing Program, *Finddat, *Change, *Testdisk.
Disk- 5	*DISKFIX 1, *DISKFIX 2, **LETTER, **LOVESIGN, **BLACKJAK, **BOWLING.
Disk- 6	**Purchase Order, Index (Disk file indx).
Disk- 7	Linking Loader, Rload, Harkness.
Disk- 8	Crtest, Lanpher (May 82).
Disk- 9	Datecopy, Diskfix9 (Aug 82).
Disk-10	Home Accounting (July 82).
Disk-11	Dissembler (June 84).
Disk-12	Modem68 (May 84).
Disk-13	*Iniunf68, Testmf68,*Cleanup,*Dskalign.Help,Date.Txt.
Disk-14	*Init, *Test, *Tenninal, *Find. *Diskedit, Init.Lib.
Disk-15	Modem9 + Updates (Dec. 84 Gilchrist) to Modem9 (April 84 Commo).
Disk-16	Copy.Txt, Copy.Doc, Cat.Txt, Cat.Doc.
Disk-17	Match Utility, RATBAS, A Basic Preprocessor.
Disk-18	Parse.Mod, Size.Cmd (Sept. 85 Armstrong),CMDCODE, CMD.Txt (Sept. 85 Spray).
Disk-19	Clock, Date, Copy, Cat, PDEL.Asm & Doc., Errors.Sys, Do, Log.Asm & Doc.
Disk-20	UNIX Like Tools (July & Sept. 85 Taylor & Gilchrist). Dragon.C, Grep.C, LS.C, FDUMP.C.
Disk-21	Utilities & Games - Date, Life, Madness, Touch, Goblin, Starshot, & 15 more.
Disk-22	Read CPM & Non-FLEX Disks. Fraser May 1984.
Disk-23	ISAM, Indexed Sequential file Accessing Methods, Condon Nov. 1985. Extensible Table Driven. Language Recognition Utility, Anderson March1986.
Disk-24	68' Micro Journal Index of Articles & Bit Bucket Items from 1979 - 1985, John Current.
Disk-25	KERMIT for FLEX derived from the UNIX ver. Burg Feb. 1986. (2)-5" Disks or (1)-8" Disk.
Disk-26	Compacta UniBoard review, code & diagram, Burlison March '86.
Disk-27	ROTABIT.TXT, SUMSTEST.TXT, CONDATA.TXT, BADMEN.TXT.
Disk-28	CT-82 Emulator, bit mapped.
Disk-29	**Star Trek
Disk-30	Simple Winchester, Dec.'86 Green.
Disk-31	*** Read/Write MS/PC-DOS (SK*DOS)
Disk-32	Heir-UNIX Type upgrade - 68MJ 2/87
Disk-33	Build the GT-4 Terminal - 68MJ 11/87 Condon.
Disk-34	FLEX 6809 Diagnostics, Disk Drive Test, ROM Test, RAM Test - 68MJ 4/88Koipi.

NOTE:

This is a reader service ONLY! No Warranty is offered or implied, they are as received by 68' Micro Journal, and are for reader convenience ONLY (some MAY include fixes or patches). Also 6800 and 6809 programs are mixed, as each is fairly simple (mostly) to convert to the other. Software is available to cross-assemble all.

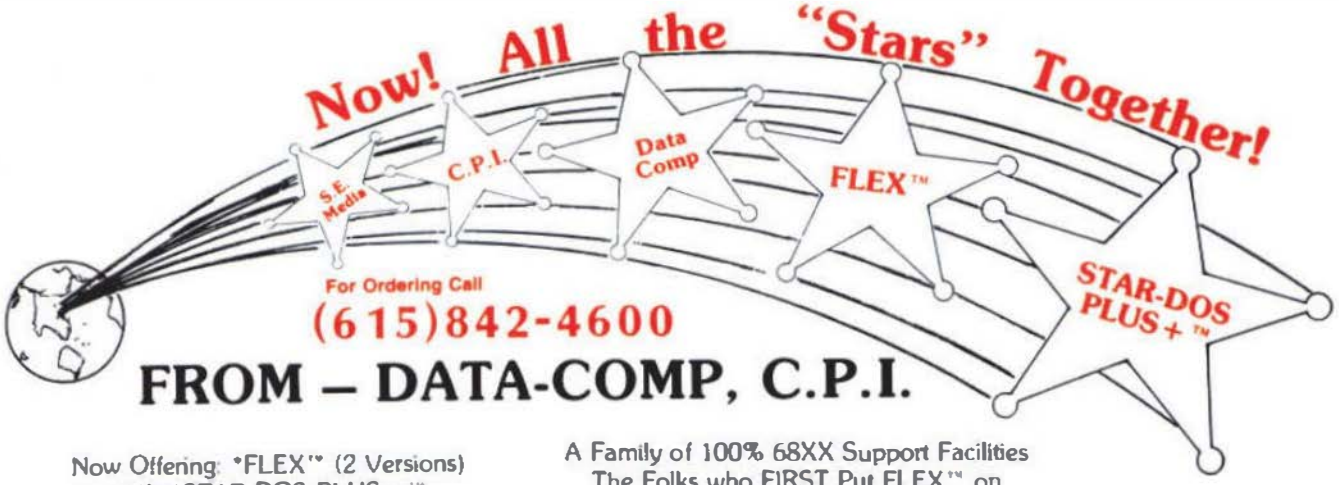
* Denotes 6800 - ** Denotes BASIC
*** Denotes 68000 - 6809 no indicator.

8" disk $19.50
5" disk $16.95

Shipping & Handling -U.S.A. Add: - $3.50
Overseas add: $4.50 Surface - $7.00 Airmail

68 MICRO JOURNAL

5900 Cassandra Smith Rd.
Hixson, TN 37343
(615) 842-4600 - Telex 510 600-6630



FROM – DATA-COMP, C.P.I.

Now Offering: *FLEX™ (2 Versions)
AND *STAR-DOS PLUS+™

A Family of 100% 68XX Support Facilities
The Folks who FIRST Put FLEX™ on
The CoCo

FLEX-CoCo Sr.
with TSC Editor
TSC Assembler
Complete with Manuals
Reg. $250.00 **Only $79.95**

STAR-DOS PLUS+
- Functions Same as FLEX
- Reads - writes FLEX Disks
- Run FLEX Programs
- Just type: Run "STAR-DOS"
- Over 300 utilities & programs to choose from.

$34.95

FLEX-CoCo Jr.
without TSC Editor & Assembler
$49.95

PLUS

ALL VERSIONS OF FLEX & STAR-DOS• INCLUDE

+ Read-Write-Dir RS Disk
+ Run RS Basic from Both
+ More Free Utilities
+ External Terminal Program
+ Test Disk Program
+ Disk Examine & Repair Program
+ Memory Examine Program
+ Many Many More!!!

TSC Editor
Reg $50.00
NOW $35.00

TSC Assembler
Reg $50.00
NOW $35.00

CoCo Disk Drive Systems

2 THINLINE DOUBLE SIDED DOUBLE DENSITY DISK DRIVES SYSTEM WITH POWER SUPPLY,CABINET,DISK DRIVE CABLE,J&M NEW DISK CONTROLLER JFD-CP WITH J-DOS,RS-DOS OPERATING SYSTEMS.	$469.95
* Specify What CONTROLLER You Want J&M, or RADIO SHACK	
THINLINE DOUBLE SIDED DOUBLE DENSITY 40 TRACKS	$129.95

Verbatim Diskettes

Single Sided Double Density	$ 24.00
Double Sided Double Density	$ 24.00

Controllers

J&M JFD-CP WITH J-DOS	$139.95
WITH J-DOS, RS-DOS	$159.95
RADIO SHACK 1.1	$134.95
RADIO SHACK Disk CONTROLLER 1.1	$134.95

Disk Drive Cables

Cable for One Drive	$ 19.95
Cable for Two Drives	$ 24.95

MISC

64K UPGRADE FOR C,D,E,P, AND COCO 11	$ 29.95
RADIO SHACK BASIC 1.2	$ 24.95
RADIO SHACK DISK BASIC 1.1	$ 24.95
DISK DRIVE CABINET FOR A SINGLE DRIVE	$ 49.95
DISK DRIVE CABINET FOR TWO THINLINE DRIVES	$ 69.95

PRINTERS

EPSON LX-80	$289.95
EPSON MX-70	$325.95
EPSON MX-100	$495.95

ACCESSORIES FOR EPSON

8148 2K SERIAL BOARD	$ 89.95
8149 32K EXPAND TO 128K	$169.95
EPSON MX-RX-80 RIBBONS	$ 7.95
EPSON LX-80 RIBBONS	$ 5.95
TRACTOR UNITS FOR LX-80	$ 39.95
CABLES & OTHER INTERFACES CALL FOR PRICING	

DATA-COMP
5900 Cassandra Smith Rd.
Hixson, TN 37343

MasterCard VISA

SHIPPING
USA ADD 2%
FOREIGN ADD 5%
MIN. $2.50

(615)842-4600
For Ordering
Telex 5106006630

An Ace of a System in Spades! The New

MUSTANG-08/A™

Now with 4 serial ports standard & speed increase to 12 Mhz CPU + on board battery backup and includes the PROFESSIONAL OS-9 package - including the $500.00 OS-9 C compiler! This offer won't last forever!

NOT 128K, *NOT* 512K

FULL 768K No Wait RAM

The MUSTANG-08™ system took every hand from all other 68008 systems we tested, running OS-9 68K!

The MUSTANG-08 includes OS9-68K™ and/or Peter Stark's SK*DOS™. SK*DOS is a single user, single tasking system that takes up where *FLEX™ left off. SK*DOS is actually a 68XXX FLEX type system *(Not a TSC product.)*

The OS-9 68K system is a full blown multi-user, multi-tasking 68XXX system. All the popular 68000 OS-9 software runs. It is a speed *whiz on disk I/O.* Fact is, the MUSTANG-08 is faster on disk access than some other 68XXX systems are on memory cache access. Now, that is fast! And that is just a small part of the story! See benchmarks!

SALE!!!

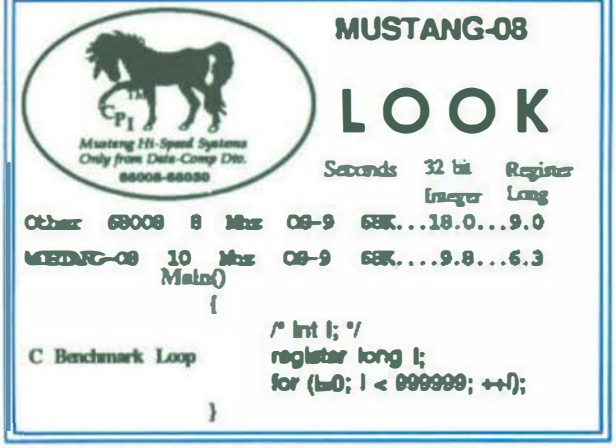
System includes OS-9 68K or SK*DOS - Your Choice

Specifications:

CPU	MC68008	12 Mhz
RAM	768K No Wait States	256K Chips
PORTS	4 - RS232 2 - 8 bit Parallel	MC68681 DUART MC6821 PIA
CLOCK	MK48T02	Real Time Clock Bat. B/U
EPROM	16K, 32K or 64K	Selectable
FLOPPY	WD1772	5 1/4 Drives
HARD DISK	Interface Port	WD1002 Board

Now more serial ports - faster CPU Battery B/U - and $850.00 OS-9 Professional with C compiler included!

***$400.00** See Mustang-02 Ad - page 5 for trade-in details



Now even faster! with 12 Mhz CPU

C Compile times: OS-9 68K Hard Disk	
MUSTANG-08 8 Mhz CPU	0 min - 32 sec
Other popular 68008 system	1 min - 05 sec
MUSTANG-020	0 min - 21 sec

25 Megabyte Hard Disk System

$2,398.90

Complete with PROFESSIONAL OS-9 includes the $500.00 C compiler, PC style cabinet, heavy duty power supply, 5" DDDS 80 track floppy, 25 MegByte Hard Disk - Ready to Run

Unlike other 68008 systems there are several significant differences. The MUSTANG-08 is a full 12 Megahertz system. The RAM uses NO wait states, this means full bore MUSTANG type performance.

Also, allowing for addressable RDM/PROM the RAM is the maximum allowed for a 68008. The 68008 can only address a total of 1 Megabytes of RAM. The design allows all the RAM space (for all practical purposes) to be utilized. What is not available to the user is required and reserved for the system.

A RAM disk of 480K can be easily configured, leaving 288K free for program/system RAM space. The RAM DISK can be configured to any size your application requires (system must have 128K in addition to its other requirements). Leaving the remainder of the original 768K for program use. Sufficient source included (drivers, etc.)

FLEX is a trademark of TSC MUSTANG-08 is a trademark of CPI

Data-Comp Division

A Decade of Quality Service"

Systems World-Wide

Computer Publishing, Inc. 5900 Cassandra Smith Road

Telephone 615 842-4601 - Telex 510 600-6630 Hixson, Tn 37343

* Those with SWTPC Hi-density FLEX 5" - Call for special info.